An MDM PUBLICATION
Issue 45 – March 2013

# APF

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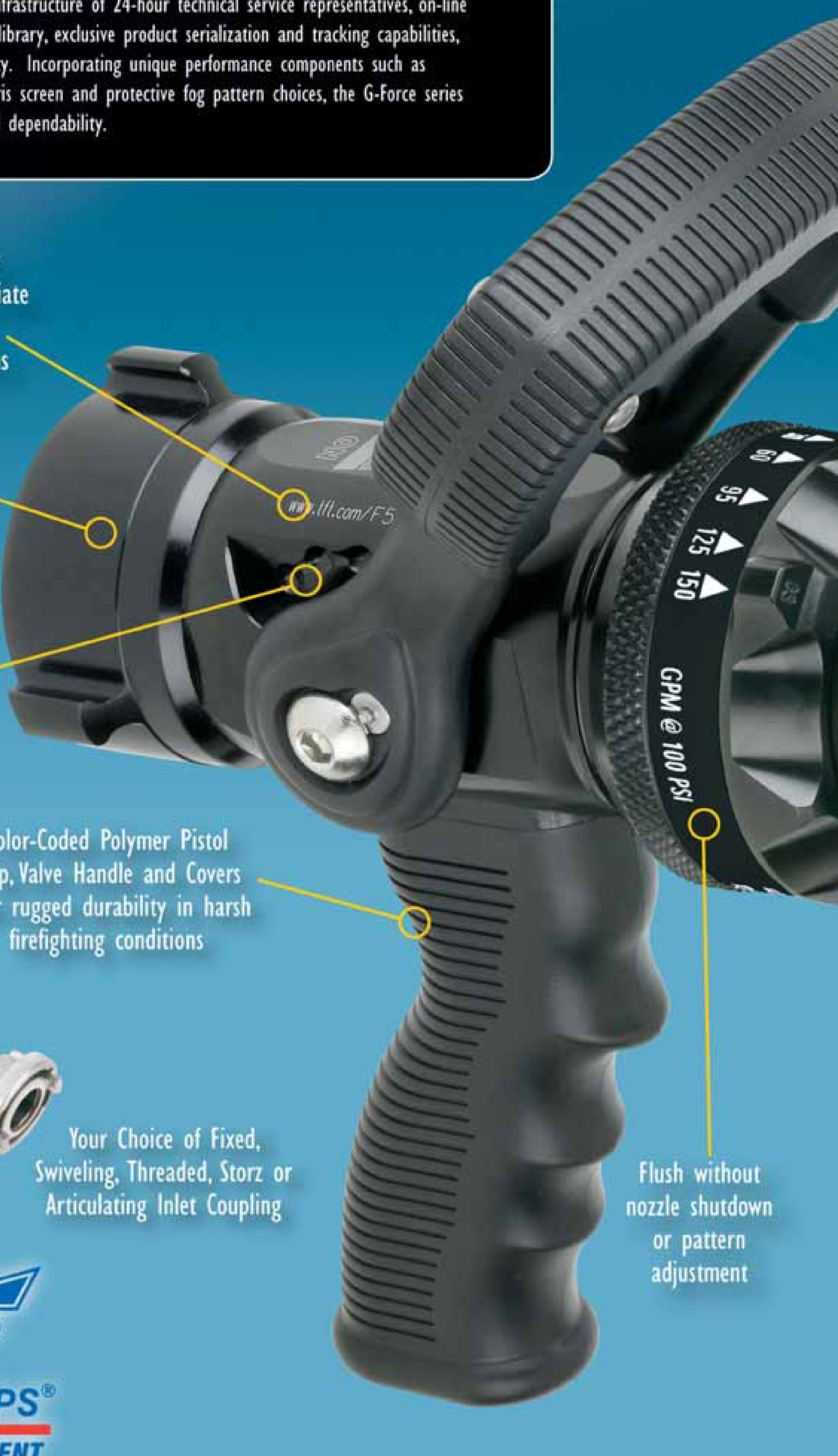
# ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

## G-Force Nozzles: The Inside Story

Based on a highly customizable global nozzle platform design, the unique G-Force series of fixed, selectable, and automatic nozzles combine over 40 years of Task Force Tips design innovation and experience into true next generation firefighting tools. Manufactured exclusively at TFT's USA production facilities, the G-Force series is supported by an extensive infrastructure of 24-hour technical service representatives, on-line documentation, digital video training library, exclusive product serialization and tracking capabilities, and a proven 5 year product warranty. Incorporating unique performance components such as a stainless steel slide valve, inlet debris screen and protective fog pattern choices, the G-Force series delivers high performance and rugged dependability.



Serialization provides track-ability and immediate access to on-line operational instructions

Integral Inlet Screen prevents debris from entering nozzle and affecting stream quality

Stainless Steel Slide Valve provides turbulence-free flow control when gated

Color-Coded Polymer Pistol Grip, Valve Handle and Covers offer rugged durability in harsh firefighting conditions

Flush without nozzle shutdown or pattern adjustment

Your Choice of Fixed, Swiveling, Threaded, Storz or Articulating Inlet Coupling

TASK FORCE TIPS®

FIRE FIGHTING EQUIPMENT

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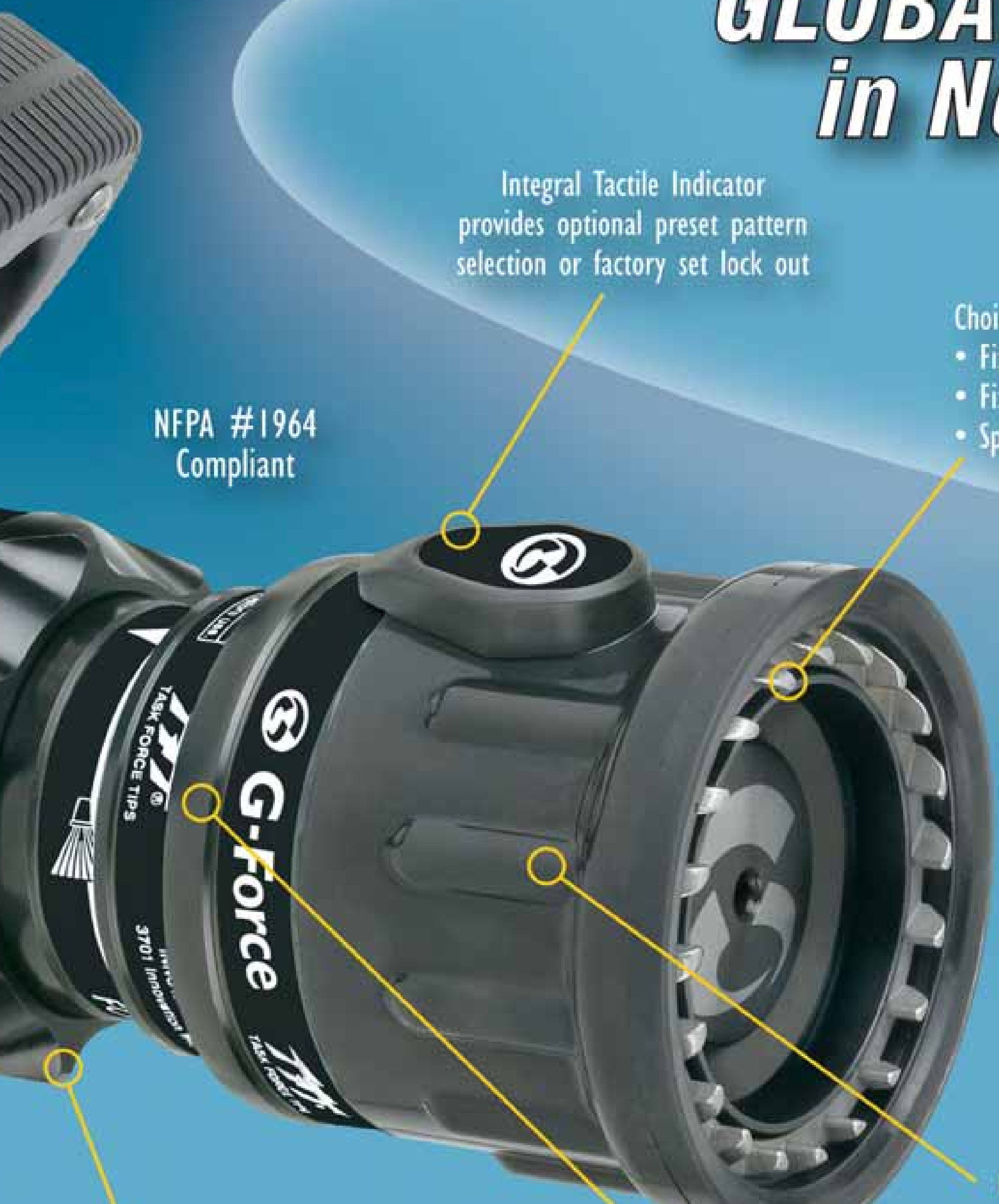
# The NEW GLOBAL FORCE in Nozzles



Integral Tactile Indicator provides optional preset pattern selection or factory set lock out

NFPA #1964 Compliant

Choice of:
- Fixed Metal
- Fixed Molded Rubber
- Spinning Stainless Steel (shown)

Choice of:
- Fixed Pressure and Flow
- Selectable Flow with Fixed Pressure, or
- 3 Automatic Pressure and Variable Flow Choices

Choice of:
- Tip Only
- Shutoff
- Shutoff with Grip Models

Bonded Rubber Bumper provides maximum durability in harsh conditions

Lightweight Hard Anodized Aluminum Alloy Body includes permanent laser engraved operational markings and highly visible reflective labeling

Large Index Ring with Indicator allows easy flow, pressure or flush selections with a gloved hand

G-Force™

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**March 2013**
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The challenges of aggressive interior firefighting demand high performance equipment built for rugged durability and dependability. The Task Force Tips MidMatic nozzle shown in this shot are built to rigorous international standards to meet emergency service professional demands.

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APF is published quarterly by:
MDM Publishing Ltd
The Abbey Manor Business Centre,
The Abbey, Preston Road, Yeovil,
Somerset BA20 2EN, United Kingdom
Tel: +44 (0) 1935 426 428
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Website: www.mdmpublishing.com

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**Subscriptions:** For your free subscription, please register at
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ISSN – 1476-1386

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Page design by Dorchester Typesetting Group Ltd
Printed in the UK

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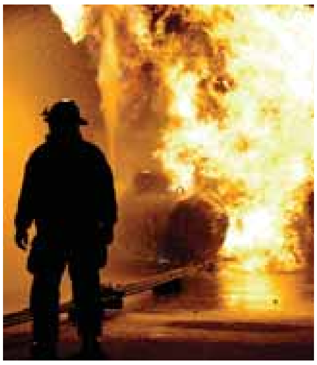
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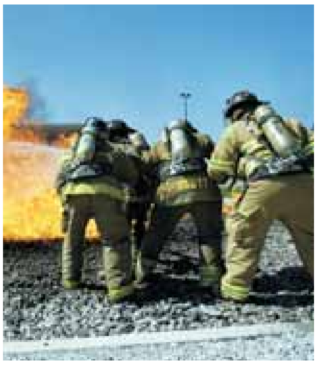
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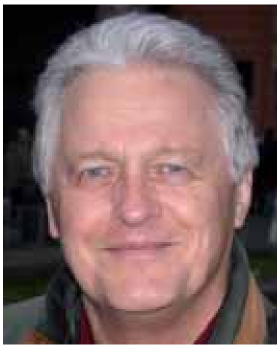

**By Graham Collins**

# Under Attack

Once again, the Australian state of Queensland had to pick up the pieces, this time in the aftermath of tropical cyclone Oswald. Coming hard on the heels of bushfires across the state, Queensland's fire and rescue service almost seamlessly had to transfer its attention to flood water rescue operations. The way in which these professional emergency service personnel meet every challenge thrown at them rightfully deserves our highest praise and admiration, the more so as many are volunteers.

So, it stopped me in my tracks when I learnt that a researcher at one of the country's universities had expressed the view that the nation spends too much on fire prevention. His argument appears to be that, dollar for dollar, it would be justified to switch some of the fire prevention budget to improving road safety. Academically, this argument might well have some financial justification, but I feel it misses the point.

First, the primary driver of fire prevention is to save lives; it is as simple as that. This therefore begs the question: how much is a human life worth? If anyone believes they can answer that question, I feel they are in serious need of reassessing their attitude to their fellow man. I would also suggest that, having arrived at a figure, they ask themselves if they feel it applies to their own wife or husband, children or parents.

**How much is a human life worth? If anyone believes they can answer that question, I feel they are in serious need of reassessing their attitude to their fellow man.**

This is not to deny the need to invest more in other areas – such as road safety – where lives are lost. Indeed not. My argument is that funds should not be siphoned from one essential area to fund another. Rather, we should be looking for politicians in every country to curb spending in non-essential or merely status-building activities and direct it at what should be their constant top-of-the-agenda interest, namely the safety, health and wellbeing of their nation's population.

The second point that I feel this cost/benefit analysis misses is that those involved in fire safety across the Asia Pacific region – in fact, worldwide – no longer have the remit to deal solely with fires, which is why we now refer to the "fire and rescue" service and not the old outdated title of "fire brigade". If countries go down the route this researcher is indicating, they will have to be willing to risk that their fire and rescue service may not be sufficiently well manned or adequately resourced to deal with bushfires, cyclones, tornadoes, earthquakes, volcanic eruptions and floods.

In case this latter point needs emphasising, the indisputable fact is that natural disasters are getting more ferocious and more frequent, so there will be even greater demands placed on the emergency services.

According to the USA's National Climatic Data Centre, in the 15 year period between 1980 and 1995 there were 46 natural disasters in the USA causing damages in excess of US$ one billion. This compares with the 15 year period from 1995 to 2010 where and the number of disasters in the USA in this category nearly doubled to 87. In 2011, the USA suffered 14 disasters in the US$ one billion plus category, against the previous 15-year average of fewer than six. 2011 also experienced the most costly disaster of all time, the Japanese earthquake and tsunami that cost a staggering US$235 billion.

In financially troubled times spending inevitably goes under the spotlight's glare. Perhaps though, rather than suggesting diluting one essential life safety service to fund another equally deserving activity, it would be better to seek adequate resourcing for all such endeavours at the expense of those activities that do not impact on safety. APF

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**Matt Klaus**

NFPA

# Too Much of a Good Thing?

## The Problem of Taking NFPA 25 Inspections Too Far

Sprinkler system maintenance and management of change are critical topics that impact property owners and inspectors around the globe. No matter how well a system is designed, the day the systems are brought on-line, their functionality can only decrease.

The battle against diminishing functionality of a system does not have to be a foregone conclusion however thanks to NFPA 25 (*Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems and NFPA 3, Recommended Practice for Commissioning and Integrated Testing of Fire Protection and Life Safety Systems*).

It is not uncommon to see "design issues" noted on an inspector's deficiency report following a review of a sprinkler system as required by NFPA 25. The question is: should "design issues" be noted at all?

**It is not uncommon to see "design issues" noted on an inspector's deficiency report following a review of a sprinkler system. The question is: should "design issues" be noted at all?**

While it seems like common sense for inspectors to identify such problems, design deficiencies are not part of the scope of NFPA 25. From an inspection standpoint, NFPA 25 is written as a "wear and tear" document, not a design evaluation standard – a differentiation that often leaves people scratching their head. While design deficiencies and failures in managing change can create serious life safety concerns and have been attributed to the failure of water-based fire protection systems, it is important to understand where these issues should be documented, and by whom.

Inspections conducted in accordance with NFPA 25 should focus on the functionality of the system or component. The central question in an NFPA 25 inspection is, can this component or system function properly in its current state? The answer to this question can usually be made from the floor level relatively quickly, and includes things like leaking sprinklers, paint on deflectors, and corroded control valves.

By comparison, a design evaluation, or retro-commissioning event is a confirmation that the system was designed and installed in accordance with the appropriate design standard at the time of construction. Here, the central question is, was this component or system designed and installed appropriately based on the applicable code or design standard? Answering this question requires the person conducting the evaluation to have some knowledge of the original system design, the applicable codes and standards, and the design drawings for the property. In this case, each device would have to be thoroughly reviewed. A design evaluation of a typical office building, for instance, would require the inspector to measure all distances between sprinklers, as well as distances to possible obstructions – hundreds of individual measurements.

That is not to say that inspectors should not inform building owners that there may be an issue with a system. The problem with providing a client with more information though is that it can open the inspector to liability. If an inspector is identifying some design deficiencies on his NFPA 25 inspection report, but not all of them, the line can become blurred as to the depth of the review and the inspector's contractual obligation. Many owners believe that NFPA 25 requires the inspector to conduct a design evaluation, so when an inspector provides a few design issues mixed in with proper NFPA 25 deficiencies, it can further muddy the waters.

Many inspectors feel they have a moral and ethical obligation to inform their clients of all potential concerns. One way to comply with the requirements of NFPA 25 while still satisfying that moral obligation is to keep two deficiency reports: one dealing with NFPA 25 issues and another that could be called the "good Samaritan" list. The NFPA 25 report catalogues wear and tear issues while clearly identifying the scope of NFPA 25. The "good Samaritan" report lists all other items that are beyond the scope of NFPA 25, along with a disclaimer stating that these items are not considered part of an NFPA 25 inspection program. This way the scope of NFPA 25 is clearly acknowledged, as are any and all problems observed during the inspection. APF

**Matt Klaus** is a senior fire protection engineer at NFPA and staff liaison on NFPA 13, 13R, 13D

For further information, go to www.nfpa.com

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# Darley Launches New Fire Sprinkler Pumps

W S DARLEY & CO. is pleased to announce it will enter the fire sprinkler pump market. Due to the widespread use of highly combustible materials and increasing government regulations the need for residential fire sprinklers is of growing importance. Darley will offer a full line-up of economically priced products with the ability to provide a plug and play system for any NFPA 13D application.

Fire sprinkler systems make an undeniable contribution to saving lives, and there is considerable growth potential in the market, particularly in the USA as states pass laws mandating the installation of fire sprinkler systems in new residential buildings. Darley's new line of pumps fills a major void in the market, and its new pumps will make a major change to residential fire protection, and in doing so save lives and reduce property damage and losses.

Darley's new Standard unit is an entry level pressure-based system with a very economical price point. The Standard Plus is the market's only panel-based system with a weekly Pumperciser. The Pumerciser is a built-in auto exerciser. Once a week, the pump will automatically exercise itself, which will help ensure reliability. All systems use a commercial-grade high efficiency stainless steel pump. The packaged systems include a pre-plumed stainless steel suction and discharge manifold, including pressure gauges to monitor constant pressure readings.

Darley's self-testing systems (STS) features patent-pending technology with the potential to forever change the residential fire safety market. The STS offers the market's only self-calibrating and self-testing system. It makes installation as easy as pushing a button and ownership as easy as looking for the Green Check. After installation, there is no required human intervention to operate or test the system.

Darley kept end users peace of mind at the forefront when designing the new offering, and integrated several additional safety features. For example, three key safety features are: recovery mode; seal saving mode; and jockey pump mode. Recovery mode prevents unwanted damage to the pump during non-fire conditions by ensuring that the pump runs for the minimum NFPA requirement of ten minutes whenever the pump is activated. Seal saving mode recirculates fresh water inside the seal chamber to help reduce the risk of burning a mechanical seal during recovery mode. Jockey pump mode allows the system to recharge due to a potential slow steady drop in pressure.

Darley will offer a full line-up of systems with its Standard, Standard Plus and Self-Testing System. These are complimented with a very basic Standard-Price Saver (PS) model and a packaged dual Self-Testing System model. The Standard-PS comes in a packaged box with a pump, pressure switch and pressure gauge. The Dual STS has the same features as the Self-Testing System and offers end users 100% redundancy. All of these options enable Darley to offer an unlimited range of pump capabilities. No project is too big and Darley is committed to help you with your fire protection needs. **APF**

Darley

FIRE SPRINKLER PUMPS by Darley

For more information, go to www.firesprinklerpumps.com

# Vehicle Boosts Firefighting Efficiency and Safety

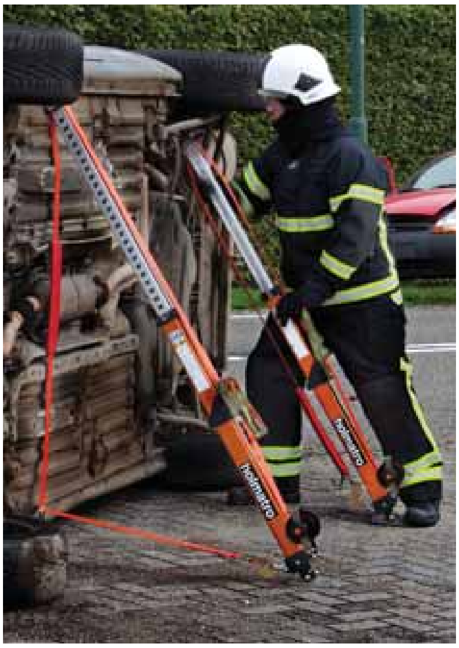
GRADALL INDUSTRIES is introducing the Strategic Emergency Response Vehicle [SERV] FA 50 firefighting device, designed to be mounted on a fire truck to dramatically increase firefighting efficiency and safety.

The rugged Gradall hydraulic boom can telescope out 15.2 metres and uses a stainless steel 5th-man nozzle attachment to ventilate buildings by breaking through walls and roofs as well as reaching through windows, rotating up to 220° or swinging to the left and right. Once inside a burning structure, the 5th-man nozzle has 52 aqua-jet nozzles that direct a massive broken stream curtain of water – or Class A or Class B foam for chemical fires – into the fire.

Firefighters can control the FA 50 from over 60 metres away using a wireless remote control device. This allows the firefighter to precisely position the apparatus with an easy-to-use system of controls on the belt-held remote device. For extra fire truck stability, the FA 50 is equipped with four stabilisers that are also controlled with the wireless remote. The stabilisers telescope out and down and can be positioned all at once or independently, providing short jacking capabilities.

**For more information, go to www.gradallserv.com**

# Instant Vehicle Stabilisation



The HOLMATRO V-Strut is designed to help rescue workers stabilise any type of car quickly, easily and safely after a road traffic accident. Incorporating an integrated head, non-slip base plate and tensioning belt with a hook and ratchet mechanism, this lightweight, all-in-one tool is ready for immediate use at a rescue scene.

With its unique auto-lock system, the V-Strut takes just 15 seconds to set up. All a rescue worker has to do is pull it out to the required length and it locks automatically in a single movement. Fine length adjustment allows accurate positioning of the V-Strut whether the vehicle is on its side or roof. A tensioning belt with a hook and ratchet mechanism secures the V-Strut to the car, rapidly creating a stable triangle. In addition, the serrated, multi-purpose head maintains a firm grip and the non-slip base plate prevents the strut from sliding away on any surface.

The V-Strut has a high shoring capacity of 16 kN. Nevertheless it weighs only 7.2 kilogrammes, so is easy to carry and handle. A sliding heat-resistant cover protects the tensioning belt against hot exhausts.

**For more information, go to www.holmatro.com**

# Research Funding Boosted

BUSHFIRE CRC (The Bushfire Cooperative Research Centre) has welcomed the Australian Government announcement to create an expanded national centre for research into bushfires and natural hazards. Aud$47 million will be invested over eight years for a new Bushfire and Natural Hazards Cooperative Research Centre, starting in July 2013. This Centre will build on the ten years of national research by Bushfire CRC and will expand research into other hazards including floods, earthquakes, cyclones and tsunamis.

Funding for Bushfire CRC was scheduled to end in June 2013, so the announcement was timely and with a long term vision. Gary Morgan, CEO of the Bushfire CRC, said: “The creation of the first national centre for combined research into fire and natural hazards is a welcome development by the Australian Government. The knowledge and expertise that has been built up over the past decade in national bushfire research can now continue and be expanded into related areas involving other natural hazards.”

Current bushfire research projects including communicating warnings, community education and resilience, incident management, severe weather, urban planning, ecology and biodiversity, and emergency worker safety, have the potential to be extended across other natural hazards. In addition, there are new areas of research that will be opened up under this broader research centre.

**For more information, go to www.bushfirecrc.com**

# Matching the Needs of Today's Firefighters

Firefighters around the world are exposed to the toughest conditions while on duty. During firefighting and rescue operations they experience varying environments and climatic conditions that impact them physically. In order to reduce fatigue, heat-stress and confinement issues as well as maximize durability and comfort, LION has made it its mission to develop PPE (Personal Protective Equipment) in a way to minimise the physiological constraints on the wearer.

The superior design, durability and holistic service via TotalCare garment management system provided by Lion has led to contracts around the globe with major agencies including the Hong Kong Fire Service Department, Singapore Civil Defence Force, Brandweer Amsterdam and the South Australian Metropolitan Fire Service, to name but a few.

## Utilising State-of-the-Art Material

Lion ensures that garments are continually getting lighter while vastly improving their level of protection, breathability, durability and comfort. Of the multiple assemblies and composite constructions Lion has available to meet with the end users' requirements, the three-layer or two-layer construction, utilising the spacer technology is one of which Lion is specifically proud. Through combining the thermal and moisture barriers into a single composite, this technology reduces tremendously he overall weight of garment, therefore making it less bulky and improving overall movability. This patented Lion innovation significantly revolutionises the way firefighting PPE is manufactured.

## Optimizing Ergonomics

Optimizing ergonomics is essential to enable the first responder's freedom of movement. For this reason, Lion's garments are designed and produced to move in synergy with the firefighter's natural body movements. The raglan cut of the jacket allows the wearer to work overhead or in confined spaces without limiting the reach of the wearer – while at the same time preventing the hem of the coat rising up, thus minimising exposure. Together with the high-waist-cut trousers, this ensures that there is always sufficient overlapping of the jacket and pants. A lengthened sleeve and a thumb loop integrated into the cuff prevents the sleeve from slipping back to expose the hand and/or arm, provides optimum protection irrespective of the glove length.

The legs and arms of each garment are contoured to enhance natural movement and motion for the firefighter. Notched elbows and knees greatly reduce excess material from gathering behind these joints, providing greater freedom of movement while minimising wearer fatigue. The padded suspenders prevent compression when carrying personal equipment like breathing apparatus and assist by carrying the weight of the trousers evenly across the shoulders.

## Safety Features

Safety features are essential for any suit, to assist in situations requiring prevention or quick response. All Lion garments have an inspection portal enabling the assessment of the internal composition fabrics of each individual garment. This ensures that the garments are "ready for action" and offer sufficient protection. Should first responders find themselves in a volatile situation, Lion garments are available with integrated drag-rescue-devices (DRD), rescue loops and/or panic-zipper.

## Creating Innovations

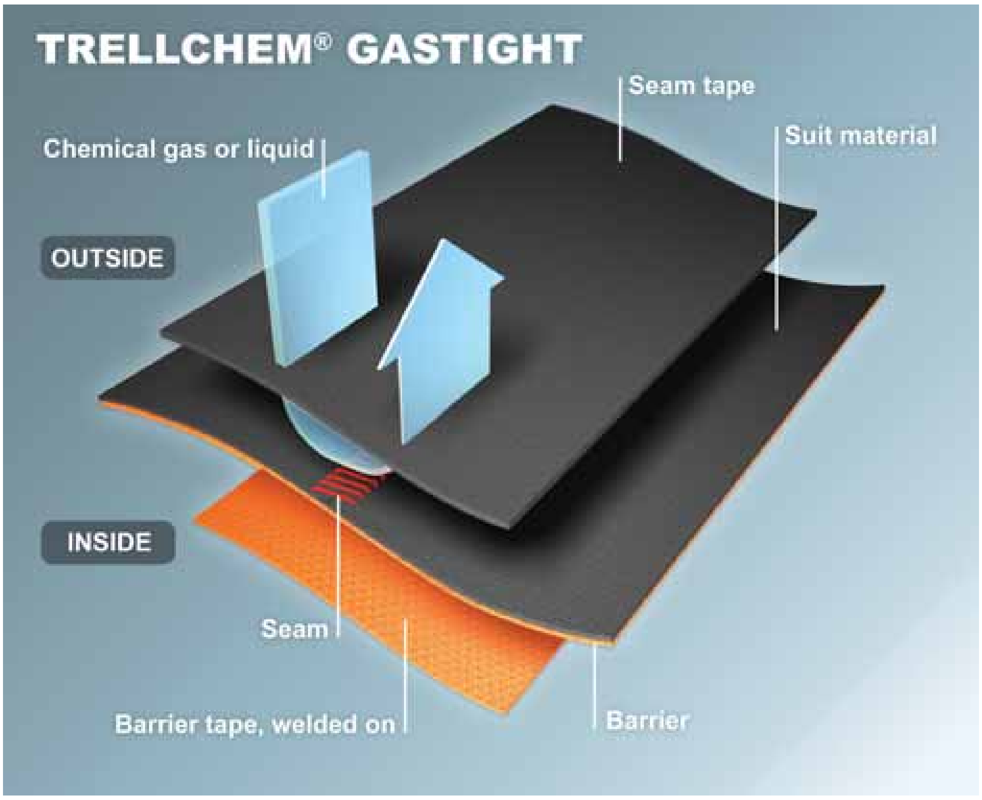
Creative innovation is essential to ensure Lion can always cater to the evolving needs of the first responder community. Apart from the spacer technology and the integrated rescue loop in its garments, Lion invented the vented moisture barrier (VMB). This reduces the build-up of heat beneath the turn-out coat by allowing air flow into the jacket – key in reducing heat stress while enroute to a call or while engaged in exterior firefighting operations. Furthermore, our Cooline suspenders actively reduce the temperature beneath the coat, helping to maintain the comfort level and further reducing heat stress. The TotalCare Service offered by Lion around the globe is another innovation that speaks for the capabilities of our company, giving the customer the ability to choose service modules from design over laundry and inspection to disposal of garments. The TotalCare solution has proven to prolong the durability of garments drastically.

By incorporating all these features and services, Lion is able to provide a quality second to none in the PPE industry. Lion's professional products and services, as well as its transparency help to provide customers with cost-effective solutions. Lion works collaboratively with its customers to ensure the final product meets with their operational requirements while consistently exposing them to the latest in world-class designs and global innovations. APF

For more information, go to
www.lhd-group.com

# Trellchem® EVO

## Unique seam technology



*The Trellchem® seam technology is unique. With a welded on barrier tape, the barrier film becomes unbroken i.e. continuous all over the suit, and thereby guarantees the same or even longer permeation times than the suit material itself*

### Certificates and Approvals:

- NFPA 1991 including optional flash fire and liquefied gas protection requirements
- EN 943-2/ET
- EN 943-1
- EN 1073-2 radioactive particles
- EN 14126 infective agents
- Approved for use in explosive environments Zone 0, Group IIC according to ATEX Directive 94/9/EC
- EN 1149-5 "antistatic" material

### Chemical Protective Properties:

- Both suit material and seams have 24 hours permeation time against 20 industrial chemicals (Intertek test report no G100223141CRT-001A)
- The suit material alone has 24 hours permeation time against the six most known warfare agents, i.e. HD, L, GA, GB, GD and VX (TNO ref 03D1/514/15176/brap)

### Components and Accessories:

- Trellchem® Bayonet glove ring – very quick glove installation and no tape required
- Wide vision visor with 3D depth of 20 cm, giving extra side view
- Suit ventilation always included
- NFPA certified with 5 different passthroughs
- Ergonomically designed inner barrier glove
- Customizable labels on outside of suit
- Silicone over socks with each suit (sock/bootie model) for easy boot donning – attached boot configuration also available

### Material and Seams:

- Viton® rubber top coating – chemical resistance
- Aramid base fabric – as in your turnout gear
- Multilayer barrier film – gives more than 24 hours permeation (Intertek test report no G100223141CRT-001A)
- Advanced material construction, yet with maintained softness
- Welded seams – continuous chemical barrier providing the same chemical protection as the suit material
- US utility patent granted for Trellchem EVO material (patent no: US 8,247,077 B2) APF

Ansell

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# Researchers in Bushfire Zones

An independent research task force deployment to Tasmania, Australia in January at the request of the Tasmania Fire Service was followed by similar BUSHFIRE CRC research teams being sent to communities across the state of New South Wales in February and March at the request of the NSW Rural Fire Service, after several destructive bushfires during the summer period. More than 240 interviews with residents were completed, focusing on how people responded to pre-bushfire season advice about community preparedness, and what actions they took on the day. Analysis of the interviews is now underway.

Bushfire CRC CEO, Gary Morgan, said the research was of national significance. "The data collected will help inform future public policy not just in Tasmania and New South Wales, but around Australia and New Zealand. The vital research that follows major fires is only possible through the national approach taken by the Bushfire CRC. This collaboration was not available ten years ago, before the Bushfire CRC was formed."

For the Tasmanian research, Bushfire CRC researchers were sourced from Bushfire CRC partner universities, including the universities of Tasmania, La Trobe, Western Australia, Murdoch and RMIT. For the NSW research, teams comprised researchers from the Australian National University, as well as the universities of Canberra, Canterbury (New Zealand) and La Trobe.

Previously, Bushfire CRC research task forces have been active following the Western Australia bushfires of January 2011, the Black Saturday bushfires in 2009 in Victoria, and the Eyre Peninsula fires of 2005. The findings from these previous task forces have informed inquiries including the 2009 Victorian Bushfires Royal Commission.

**For more information, go to www.bushfirecrc.com**

# Hong Kong Training School

China State Construction Engineering (Hong Kong) Ltd has appointed MOTT MACDONALD as the building services design engineer for the development of a new HK$2.88 billion Fire Services Training School (FSTS) in Tseung Kwan O, Hong Kong. The new school will replace existing facilities in the Pat Heung area of Hong Kong.

Covering an area of 17.06 hectares, the new training school will comprise 22 blocks of low and medium rise buildings, including administration offices, learning and education centres, dormitories and ancillary buildings. Indoor and outdoor physical training facilities and incident grounds will also be located on site. Additionally, the FSTS will provide simulators covering seven types of potential large and complex emergency situations – incidents related to buildings, transportation, marine and water, gas, aircraft, hazardous material and structural collapse.

The school is scheduled to be completed in the first quarter of 2015.

**For more information, go to www.mottmac.com**

# Indian Crane Fire Protection

ISO 9001:2008-certified FIRETRACE INTERNATIONAL has supplied automatic fire detection and suppression for a number of slew cranes that are used widely in the materials handling sector and are manufactured by Escort Construction Equipment Limited, one of India's premier crane manufacturers.

According to Firetrace, Escort Cranes chose its Firetrace system to ensure 100 percent response reliability, 100 percent of the time; provide around-the-clock, unsupervised protection and be capable of withstanding potentially corrosive working environments and the heavy and sometimes erratic vibration. In this instance, the Firetrace system selected was the ILP (Indirect Low Pressure) system and the suppressant was ABC dry chemical.

Firetrace systems comprise an extinguishing agent cylinder that is attached to technically-advanced proprietary Firetrace Detection Tubing. This leak-resistant polymer tubing is a linear pneumatic heat and flame detector that is designed to deliver the desired temperature-sensitive detection and delivery characteristics. Due to the flexibility of the detection tubing, it can be routed throughout the crane's engine compartment. When this tubing is exposed to heat and radiant energy from a fire, it ruptures. And the ABC power suppression agent is discharged from the cylinder through diffuser nozzles, flooding the entire engine compartment.

**For more information, go to www.firetrace.com**

# New Bushfire Protection

TETRAKO has announced the introduction of the TetraKO Wildfire Protection System, heralded as a comprehensive and integrated system that comprises the TetraKO TurboMixer, the TetraKO TurboSkid, and TetraKO's water enhancer powder concentrate.

The TurboMixer is built for large batch mixing of TetraKO powder concentrate with water for rapid off-loading to any fire apparatus. It utilises an optional Waterous pump to thoroughly circulate and mix the TetraKO solution within five to seven minutes. The TurboSkid Unit is designed for placement on the flatbed of a pickup truck or on a trailer. It comes equipped with a 750-litre tank and an 18 hp Waterous pump. The TetraKO solution can be mixed while the vehicle is in route to a wildfire.

**For more information, go to www.tetraKO.com**

# The Mi-TIC – The Best Argus Yet

The first commercial handheld thermal imaging cameras (TICs) ever used by a firefighter were designed and manufactured by e2v engineers. Argus thermal imaging cameras from e2v have a thirty year history in the emergency service market, and all our technical knowledge and experience working with first responders has led to the launch of our best cameras yet.

The Argus Mi-TIC is the world's smallest high-resolution thermal imaging camera designed for firefighting applications. It is a personal camera that any firefighter using breathing apparatus (BA) can attach seamlessly to his or her BA strap, or fix to the tunic or pocket, boasting a recording facility that continually records once the camera is switched on so incidents can be reviewed and assessed by OICs.

The Mi-TIC range offers the option of a simple on/off one-button camera to power up and go or a three-button option that allows the user to personally configure the camera's features. Both are simple to use, robust and extremely convenient units that provide a superb resolution of image while almost becoming part of the firefighter's PPE – a move that everyone will appreciate, most importantly the front-line firefighter.

The camera delivers the best image quality and clarity of any personal imager on the market. The ruggedly engineered Argus Mi-TIC is extremely lightweight at less than 750 grams and demands minimal training. It is intuitive, simple to operate and no user maintenance is required other than cleaning the imager after use. No software is necessary to download images; downloading is as simple as downloading from a digital camera. An SD card in the Argus Mi-TIC can accommodate more than four hours of recording and 1000 images.

The new camera uses Argus' advanced digital imaging technology and boasts a 69mm LCD screen – one of the largest format LCD screens on a personalised thermal imaging camera in the world. It can be held comfortably in the palm of the hand, (we have tested it using every known brand of firefighter glove) stored in a jacket for quick access, clipped outside a pocket, clipped to a lanyard or hung around the neck. It offers a simple thumb-operated on/off function with a superb start up time of under five seconds. On-screen features includes: spot temperature crosshair and reading; live temperature bar; battery indicator; temperature sensitivity; and date and time.

It comes complete with Argus' unique dual use desktop dock/in-truck charger unit. This multi-functional unit charges the Argus Mi-TIC and a spare battery when placed into the unit and locked into position. Up to six charger units can be daisy-chained together.

Other features include customer configuration that allows the user to set up the camera to work according to their own procedures and protocols, while tri-mode sensitivity allows temperature variations as high as 1832°F and as low as –40°F.

The dynamic range of the Argus Mi-TIC means that a casualty located in a very high temperature environment can still be seen by the camera's user. "One button" camera enables the user to set 'black box' recording on/off, while "three button" camera permits the user to set the function of the additional buttons for image capture, image freeze, switch application colour mode, firefighter and search/overhaul, and digital zoom. A whole raft of off-the-shelf accessories, such as a laser pointer or flash light, can be attached to the picatinny rail at the top of the camera. Thanks to the design of a quick-fit sun shroud, the camera can also be use outside in bright sunlight.

The new Argus Mi-TIC incorporates temperature and compression safe lithium phosphate battery technology. There is a two-hour and four-hour battery option and the camera's battery pack allows it to be powered by off-the-shelf AA batteries, enabling the user to use the camera in an emergency if the rechargeable batteries have run down.

Now that TICs are widely accepted, it is important for departments to become smarter consumers of new TIC technology. We have seen the number of cameras on the market slowly rising over the years, few close to the quality or reliability of Argus.

The Mi-TIC is undoubtedly the future of firefighter thermal imaging. Make the right choice – invest in thermal imaging and make sure it is an Argus. APF

For more information, go to
www.argusdirect.com

# Three for Korea

OSHKOSH AIRPORT PRODUCTS GROUP has delivered three new generation Oshkosh Striker aircraft rescue and fire fighting (ARFF) vehicles to Korea Airports Corporation (KAC), a leading airport management company located in the Republic of Korea (South Korea). The three new vehicles join two Striker 3000 vehicles that were placed into service at KAC managed airports in 2011.

The new vehicles feature advanced safety systems and deliver innovative fire suppression technology. The 6x6 axle configuration, with Oshkosh TAK-4 all-wheel independent suspension and an Oshkosh rear steering system, offers a smooth ride and excellent off-road capabilities. The 700hp, Tier 4i/Euro 5 emissions-compliant turbocharged engine is mated to a seven-speed electronic automatic transmission for smooth power delivery and a top speed greater than 113 kilometres an hour. The engine power pack components are readily accessed through walk-in doors on either side of the engine compartment for easier servicing.

Korea Airports Corporation is a leading airport management group, operating 14 airports located throughout the Republic of Korea.

Three Oshkosh Striker 1500 ARFF vehicles have also been placed into service at Port Moresby International Airport in Papua New Guinea.

**For more information, go to www.oshkoshairport.com**

# Iconic Opera House Kitchen Protection

DELTA FIRE & SAFETY has supplied a fire detection and suppression system developed specifically to safeguard the life and wellbeing of kitchen staff, diners and, ultimately, the 7.4 million visitors to Sydney Opera House and particularly the 320,000-plus people that tour the building each year.

The project, which was undertaken as part of a major renovation, refurbishment and upgrading of the kitchen of the popular Opera Bar, complies with the latest fire safety standards These include Underwriters Laboratories' UL 300 standard and the Australian standards, AS/NZ 1668 Set: 2005 and AS 3772.

The solution supplied was a pre-engineered Ansul R-102 system, to protect the cooking appliances, hoods and ductwork. The system will automatically detect and suppresses a fire in the Opera Bar kitchen before it has time to take hold. It ensures fast flame knock-down, secures vapours, and cools hot surfaces and cooking oils. The agent will not corrode the cooking equipment, and post-fire clean-up requires nothing more than flushing the affected area with water or steam. Although an automatic system, Ansul R-102 can also be triggered manually. Furthermore, immediately the system detects a fire, the gas or electric power to the kitchen appliances is cut-off prior to suppressant discharge.

**For more information, go to www.deltafire.com**

# Shining Light

TEKNOPOWER GROUP, the proprietor of Ex-light manufacturer Mica Elektro, has acquired the specialist in portable Ex-protected lighting company, Centaurea Oy in a move that Teknopower says will strengthen the position of both companies in the specialised lighting solutions market.

**For more information, go to www.mica.eu and www.centaurea.fi**

# Australian "First"

Following changes in the Building Code for Australia (BCA), Fusion Advanced – a subsidiary of global fire systems suppliers Advanced – is claiming to have become the first fire systems supplier in Australia to have its entire product range approved to the latest standards required by the BCA, which calls for all fire detection products to have 'evidence of suitability'.

Fusion Advanced products are certified to JAS-ANZ standards by SAI Global, including the latest AS4428.3 2010 standard. The company's products, including the Au5000 digital addressable fire system, wired and wireless devices and EWIS/OWS systems are also ISO 9001 approved by SAI under the five tick quality program. All Fusion Advanced's products are also approved to the latest AS7240 standards that have superseded AS4428 and AS1603.

**For more information, go to www.advel.co.uk**

# The HD Range of Deluge Skids

HD Fire Protect is a leading manufacturer of world-class water and foam based firefighting equipment. HD product range comprises of an extensive range of deluge valve models with various construction materials, trim types and features.

Deluge valves, which are also known as system control valves in a deluge system, are used for the fast application of water in spray systems. Deluge systems protect areas such as power transformer installation, storage tanks, conveyor protection and various other industrial applications. With the addition of a foaming agent, deluge valves can also be used to protect areas such as aircraft hangars and inflammable liquid stores.

In order to make deluge valve systems more user-friendly, it is necessary to consider operational ease as well as faster and convenient installation. With this in mind, HD Fire Protect has designed and manufactured a range of deluge skids. These deluge skids are standard modular packages. The skids are either standard UL Listed models or custom engineered to meet specific requirements. Primarily the skids can be categorised as skid cabinets or open-type frame mounted.

In the case of skid cabinets, the whole skid assembly is contained inside a stainless steel, powder coated cabinet. The cabinets have been designed to have an aesthetically pleasing appearance. All of the gauges are visible externally through a transparent polycarbonate window, while all of the side panels are easily removable for ease of maintenance. The cabinets can also house a temperature control feature for when skids are likely to be used in extreme or freezing temperatures. Open skids are mounted on a steel frame.

The deluge valve mounting could be vertical or horizontal. The open skids can also be supplied as multi-line deluge valve skids, where between three and six deluge valves can be mounted vertically on a single skid. There are also a number of special skid designs, for example, where factors such as space constrains need to be taken into account, when compact vertical skids are available. Flanged or grooved connections are provided, and recently HD Fire Protect also launched a skid that is suitable for sea water applications. In that case the complete skid is built using corrosion resistant materials.

The HD skids are completely pre-assembled and factory tested, and generally come with downstream, upstream and bypass valves, which can be gear operated using butterfly valves or gate valves. Instrumentation, such as pressure switches, solenoid valves, pressure transmitters, limit switches and basic control panels are mounted, pre-wired and terminated into a junction box. **APF**

For more information, go to
www.hdfire.com

## Australian & New Zealand Disaster and Emergency Management Conference

# Earth: Fire and Rain

The Australian & New Zealand Disaster and Emergency Management Conference will be held at the Mercure Hotel, Brisbane from the 28th to 30th May 2013. A joint initiative of three 'not-for-profit' organisations – the Australian Institute of Emergency Services, the Australian & New Zealand Mental Health Organisation Inc, and the Association for Sustainability in Business Inc.

**Peter Sugg**

Australian & New Zealand Disaster and Emergency Management Conference

Australian and New Zealand communities are continually facing heart-breaking losses caused by the increasing severity and frequency of natural disasters. The impact of bushfires, floods, storms, earthquakes and other hazards not only affect communities, they also affect each country's economy, infrastructure and the environment.

Acknowledging that a 'whole-of-nation' resilience-based approach to disaster management and a national, coordinated and cooperative effort is needed to enhance the capacity to withstand and recover from emergencies and disasters, the conference will focus on prevention, preparedness, response and recovery and incorporate keynote addresses, concurrent sessions and workshops covering human and social issues, economic and environmental challenges, infrastructure, community and communication topics.

The conference committee has created a comprehensive forum that shines a spotlight on resilience and offers professionals – and future professionals – an opportunity to advance and improve approaches, thoughts and opinions and develop expertise, competencies and aptitudes relating to information and facts surrounding preparedness for future disasters, emergencies and hazards and the ability to recover from them quickly and efficiently.

Four interactive optional pre-conference workshops will feature on Tuesday 28th May, covering important topics on animals in disaster, business continuity, resilience and trauma and disaster mental health. On Wednesday 29th May the conference will be opened by Hon. Jack Dempsey MP, Minister for Police and Community Safety and will follow with keynote presentations from Grant Morrison, Director of Disaster Prevention and Risk Reduction at AusAid, Associate Professor Brett Aimers, the Chief Nurse at St John Ambulance Australia, Commissioner Ian Stewart, Queensland Police Commissioner and Dr Ian Dacre Disaster Management Operations Director, Asia Pacific for the World Society for the Protection of Animals. Concurrent sessions will carry on from the keynote presentations and the day will conclude with a welcome reception where delegates can network, walk through the trade exhibition and view over 30 poster presentations.

Concurrent sessions will continue on day two and proceed with further keynote presentations by Craig Lapsley, Fire Services Commissioner of Victoria, Scott Milne the Response Manager and Global Director of the International Association of Emergency Managers, Professor Philip Morris the President of the Australian and New Zealand Mental Health Association and Dr Rob Vertessy the Director and CEO of the Bureau of Meteorology. The conference will conclude on Thursday 30th May.

Dr Allison Rowlands, the Director of Disaster Welfare at the Ministry for Police and Emergency Services, will look at the conceptualisation of and planning for major evacuation centres, the underlying principles, emergency arrangements context, and considerations for the congregate care of a large number of vulnerable people over ten days, uprooted from their home community. The presentation will focus on the town of Hay, which has 2,800 residents, where the New South Wales' (NSW) State Emergency Service (SES) issued an evacuation order on 15th March 2012.

The Welfare Services' functional area of NSW's Emergency Management Plan embarked on planning the evacuation response and arrangements for the care of the community. This resulted in the development and erection of a 500-bed major evacuation centre at Deniliquin. Numerous issues were identified and resolved by the team and implications for future planning and practice articulated. During Dr Rowlands' presentation she will explore some of these key issues that include remoteness of the intervention and supervision and support for the welfare team, responding to the needs of vulnerable groups within the evacuated community, planning leisure activities/managing boredom, managing the community meetings, tensions and psychosocial issues within the evacuated community, managing the return process and overseeing local, regional and state-level processes and relationships within the emergency management agencies.

With a quality program packed with over 70 speakers, this year's conference is one not to miss. Presenters will focus on themes such as risk and crisis management, social media, volunteer and community involvement, animals in disasters, business continuity and relief and recovery. APF

**Peter Sugg** is on the Program Committee of the Australian & New Zealand Disaster and Emergency Management Conference, and is CEO of the Australian and New Zealand Mental Health Association

For further information, go to www.anzdmc.com.au

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# What's Driving the PPE Market?

**Tom Hainsworth**

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Manufacturers working in the PPE industry appreciate only too well the huge responsibility that is bestowed upon them. This is not just a responsibility to develop and produce the highest quality fabrics and garments to be worn by firefighters, although clearly this is important. The biggest responsibility is to ensure that the garments worn by our fire services in all the different scenarios they face offer the best possible protection.

When asked what the number one objective is, my reply is always the same: "To protect individuals that work in hazardous environments from burn injury so they return home safely to their families". It therefore follows that buyers and specifiers operating in the PPE industry are both incredibly rigorous and demanding in ensuring that the garments selected to be worn by firefighters in their respective territories meet this criteria.

One of the many healthy aspects of the Australia and New Zealand fire market is that the standards for structural and wildland firefighting are driven by the fire services themselves. This ensures that the structural firefighting standard AS NZS 4967:2009 and AS NZS 4824:2006 for wildland firefighting are as aligned as possible with the day-to-day requirements of the firefighters on the frontline.

Those responsible for developing the standards and ensuring that they continue to be as relevant as possible to the challenges faced by firefighters in this part of the world are looking for a number of attributes from industry suppliers. All of these attributes are underpinned by the overriding responsibility highlighted earlier – namely, to ensure firefighters are afforded the best possible standards of protection.

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One of the most important attributes in an increasingly competitive world is the expectation that manufacturers will continue to demonstrate innovation in their product development. Innovation needs to be backed up by a strong understanding of the science behind the performance of the products that have been developed and a thorough appreciation of the risks being faced by the end user. Only by understanding these two areas well, can you properly assess the performance of the innovation in real life.

For example, every product developed by Hainsworth is subject to the most stringent levels of testing in our own accredited laboratory and, like other leading manufacturers, we pride ourselves on the attention to detail.

In developing products appropriate for the Australian and New Zealand market, there is a need to give consideration to the different challenges faced by structural and wildland firefighters. The design of fabrics is heavily influenced by the environment in which the firefighter operates and how the garments will be worn. For example, the outer shell of a structural firefighter's kit is designed to minimise the effects of heat stress and protect against the risk of flashover, while the inner lining helps to move moisture away as fast as possible.

However, in the case of the wildland firefighter, there is only one layer, which is both the outer-shell and next to the skin and therefore has to prevent heat from getting in while also moving moisture away. All kit has to be robust enough to offer high levels of thermal and mechanical protection while also being light and breathable enough to minimise heat stress.

Heat stress is the biggest killer of firefighters in the world and is a threat to both structural and wildland firefighters. However, the particular design and use of fabrics differs according to the specific environments encountered.

For example, a firefighter tackling a fire in a burning building will typically be confronted by extreme levels of heat for a relatively short period, whereas a firefighter battling a wildland blaze will be exposed to extreme heat (in the case of the recent wildland fires in New South Wales and Tasmania, temperatures hit 45°C) over a much longer period of time. Heat stress, if not managed and monitored effectively, not only endangers the life of a firefighter but, on a more day to day basis, can seriously harm the wearer’s decision-making ability which, in turn, puts the lives of colleagues on the line.

As highlighted earlier, a manufacturer is expected to have a comprehensive understanding of the science that underpins the development of specific products. The body’s internal core temperature is closely regulated and remains within a very tightly defined range from approximately 36°C to 38°C. This temperature range is maintained by controlling the equilibrium between the amount of heat the body produces through physical activity, the amount of heat stored by the body and the amount of heat lost to the surroundings through sweat evaporation and heat radiation, convection and conduction aided by vasodilation.

**One important attribute in a competitive world is the expectation that manufacturers will continue to demonstrate innovation in their product development.**

When the ambient temperature of the surroundings rises to above 35°C, heat loss through radiation, convection and conduction stops and the only way left for the body to cool itself is through sweat evaporation. This will also stop if the heat and humidity becomes excessive, causing the body to store the excess heat produced and produces a rise in the core body temperature.

Firefighter standards in this part of the world are not only rigorous in terms of the importance of the levels of protection offered; they also expect manufacturers to go considerably further. One of the biggest challenges facing those involved in the garment manufacturing process is to marry the best possible protection with the best possible levels of comfort.

Last year, the Australian Capital Territory Fire & Rescue chose to wear kit which incorporates Hainsworth Titan following a successful trial in conjunction with Australian garment manufacturing partner Stewart & Heaton. This is a patented double cloth construction with Nomex on the face to provide optimal thermal protection, abrasion resistance and colour fastness, and Kevlar on the back to provide strength. The kits offer exceptional

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heat stress management capabilities as well as comfort, wear life and durability, heat and flame protection and chemical resistance.

It is absolutely essential that those involved in the PPE industry demonstrate the ability to work in collaboration. Collaboration is essential because a complete understanding is not held by any individual fire service or member of the supply chain. For example, a firefighter needs to have an understanding of dynamic risk assessment so he can make the right call, while an understanding of the human body and the science behind burn injury is also beneficial to aid the development of PPE standards. Meanwhile, the garment manufacturer needs to understand fit, comfort and the relationship between that and protection, while a fabric innovator needs to have an appreciation of all of these requirements as well as an in-depth understanding of how different fibres react in different environments. The importance of collaboration can be seen in the choice of theme for AFAC 2013 – Shaping Tomorrow Together.

Quality control is another important requirement ensuring that the materials used in manufacturing process are from reputable sources. Interestingly, my own company can trace its connections with Australia back more than 200 years and, for the vast majority of this time, the relationship has been about Hainsworth importing Australian Merino wool for use in our Yorkshire textile mill.

The qualities of Merino wool have been known for centuries, not least its ability to regulate temperature to keep you cool when it is hot and warm when you are cold. Now, thanks to advances in textile production and finishing, the many benefits of wool are making a comeback into the world of PPE, but with a modern twist. Australian Merino wool has a big future in the manufacture of firefighters' kit. An example of this is Hainsworth Eco Dry, a range of lining fabrics incorporating the many benefits of wool to provide today's firefighter with the highest possible standards of comfort when wearing their PPE.

The unique structure of wool offers distinct properties not mimicked by any other natural or man-made fibres – properties that offer many benefits to the wearer and that will not wash out or decline over time. Another important consideration is value – but the right kind of value. There should be no place in the PPE industry for suppliers hoping to make a quick profit or achieve a short-term gain. Anyone who does go down this route will be found out quickly. Ultimately, it is the companies that take the long-term view, and invest serious time in properly understanding the requirements of our firefighters that will build and sustain the lasting relationships.

Value should be about understanding the whole life cost of a product. For example, a product with better durability may cost more at the beginning but over a period of time, it will give far greater value than an inferior product which cost less at the outset. There are a number of reasons why this is the case, not least the fact that garments of greater quality usually last longer. But one of the other trends we have identified is that firefighters themselves are more likely to respect the products they are wearing if the manufacturer has taken the time to engage with them, listen to their particular needs and provide them with PPE that they are proud to wear. Just as firefighters know when they are being given quality garments, they also know when the garments they are being asked to wear are of an inferior standard.

**One of the many healthy aspects of the Australia and New Zealand fire market is that the standards for structural and wildland firefighting are driven by the fire services themselves.**

We live in challenging times with the fallout from the global economic crisis still reverberating. Budgets are under scrutiny and fire services everywhere are under intense pressure to find cost savings wherever possible. The challenge facing businesses operating in the PPE industry is to continually demonstrate that the fabrics and products that they are bringing to the market offer value for money – not in the crudest sense of the cheapest in price, but in the more sophisticated sense that they provide long-term value for money.

From our own on-going research of the market, relationships with partner organisations and engagement with firefighters in different states, we are confident that criteria such as innovation, quality control, durability, comfort and breathability allied to protection, class leading products and customer care all remain as important as ever in the procurement process.

If the industry can maintain these high standards then everyone involved in the development of PPE will know that their collective efforts are doing the most important job of all – protecting individuals working in hazardous environments so they can return home safely to their families.

That is a common goal of which we can all be proud. APF

**Tom Hainsworth** is Managing Director of Hainsworth

For further information, go to www.hainsworth.co.uk

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# Water Mist Technology

## – History, Effectiveness & Efficiency

In recent years, water mist technology has "come of age" and is now widely regarded as a fire protection solution of choice for a fast expanding catalogue of applications.

The idea behind contemporary water mist technology is by no means new. Over 130 years ago in 1880 the US-American company F.E. Myers manufactured a back-pack system with a lance that produced water droplets that was used to fight small forest fires. Only ten years later Grinnell developed its 'pepper pot' nozzle that fought fires also using small water droplets. By 1930 there were already several companies that had started to get involved in the application of water mist or water fog. Among those was the German company, Lechler, whose main innovation was a multiple orifice nozzle that they, at the time – the 1930s – called water dust nozzle. In the 1940s Factory Mutual's engineering division started to carry out its first tests comprising small droplet nozzles.

In spite of these first efforts, the interest in water mist remained meagre over the following decades. Scientists in Europe and the USA were busy with research. But from a commercial point of view the water mist technology initially had no great impact, as it did not meet the requirements for fixed installations back then and was therefore mainly used to fight fires manually.

It was not until the 1990s that water mist started to become a force to be reckoned with. This was mainly due to two incidents.

### Incidents Levelled the Way for Water Mist

The first was the execution of the Montreal protocol on "substances that deplete the ozone layer" in the late 1980s; the second was a fire on the passenger ferry "Scandinavian Star" on the morning 7th April 1990. During this fire 158 people – nearly 50 percent of all passengers on board – were killed.

Up until the Montreal protocol had been signed, Halon – a bromine-based chemical fire suppression agent – had done a good job as a fire extinguishing media. It was effective, efficient, fairly cheap and easy to install. Its phasing out levelled the way for water mist fire suppression systems, which have consequently become an important field of study, research and development.

In areas such as fire protection it often takes severe incidents to bring about changes. The catastrophe on 7th April 1990 eventually led to an improvement of the International Maritime Organisation's (IMO) fire safety requirements and installation guidelines as well as the development of fire test procedures for alternative sprinkler systems.

There had already been a good deal of development on high-pressure water mist in Sweden between 1975 and 1990. The main objectives had been systems to protect hotels and passenger

*Picture courtesy of VID Fire-Kill*

cabins as well as research into flammable liquid hazards. Thus the fire on the Scandinavian Star allowed those having carried out this work to show their results on 20th June 1990 – just over two months after the disaster.

This was the starting point of the newly-founded Swedish company UltraFog. Only six months later another company – Marioff from Finland – also started to develop high-pressure water mist fire fighting systems. Since then many have followed their example.

Eight years later – on 4th April 1998 – the International Water Mist Association (IWMA) was founded. Its intention was, and still is, to be a platform for companies, research bodies, institutes, insurance companies, authorities having jurisdiction and individuals involved in water mist technology. With its annual conference – the 13th will be held in Paris on 16th and 17th October this year – the IWMA collects and distributes knowledge.

## How Does Water Mist Work?

Part of this knowledge is to provide answers to questions like: How does water mist work? How effective is it? How much does it cost? And: How about standards?

A fire needs three elements to add up to a fire triangle: a combustible material, heat and oxygen. Unlike traditional sprinkler systems, water mist removes two of these items: heat and oxygen (traditional sprinkler systems only remove the heat). It does so by jetting water at low, medium or high pressure through nozzles specially designed for this purpose. As the system pressure increases the size of the droplets decreases, which results in droplets with an altogether larger surface and water turning into steam. The consequence of this is a system that is able to rapidly reduce the temperature as well as the oxygen at the flame front. In this way, energy is taken away from the fire. Due to its cooling effect, water mist also prevents re-ignition.

Low pressure water mist systems work with less than 12.5 bar. The span of medium pressure lies between 12.5 bar and 35 bar and high pressure systems can reach a pressure of up to 120 bar. Each of these systems has its eligibility; low pressure being suited for different purposes than medium or high pressure and vice versa.

As less water is needed to control or put out a fire than with a traditional sprinkler system, the water mist technology may be a very cost effective way of providing fire protection. It is also environmentally friendly, causes no ozone depletion, does not contribute to global warming, does not cause massive water damage, does not harm people and is reliable.

Also as far as standards are concerned, water mist has become well established. The first body to create a standard was the National Fire Protection Association with its NFPA 750 Standard for Water Mist Fire Protection Systems, which was published in 1996. Since then other standards and guidelines for the use of water mist have been developed by FM (FM 5560), the European Committee for Standardization (CEN TS 1497) and others.

## Water Mist in Asia and the Middle East

Water mist firefighting systems are well established and have been in use for over twenty years in their present stage of technology. They have proven to provide safety systems over a wide range of applications, such as tunnels, offices, machinery spaces, escalators and computer rooms to name just a few. In some of these applications water mist is favourable due to the way the small water droplets interact with fire. In other situations it is the limited water requirement that makes water mist systems the better choice.

The Asian ship building industry is the largest in the world. In the Middle East and Japan building technology is among the most advanced in the world. There are many high-rise buildings with a high concentration of inhabitants, large covered spaces, partly underground. Transporting water from ground level to the top floor is a challenge for traditional water-based firefighting systems, which normally operate at relatively low pressure. On top of that, water in desert environments is precious and its supply costly.

The reduced requirements for water supply for water mist systems lead to less water having to be pumped up to the higher levels of high-rise buildings, a smaller required water reservoir and smaller supply lines.

Water mist can be applied in oil and gas production, processing and distribution, particularly protecting buildings storing, using or processing liquid hydrocarbons. In the offshore oil and gas industry, water mist has replaced Halon as extinguishing systems in many applications. The great advantage of using water mist in these places is the immense cooling effect of small water droplets, which can reduce fire damage to a minimum. Water mist can, in contrast with some gaseous firefighting systems, be released immediately after the detection of a fire, without any hazard to human life.

Water mist systems protect life as well as properties. The systems that manufacturers offer – many of these companies are members of the IWMA – fulfil the requirements agreed upon by this organisation. All applications of water mist are based on realistic fire tests, to ensure that the water spray produced by the particular water mist system can suppress or extinguish fires of the type that may actually occur in the specific building or industrial plant.

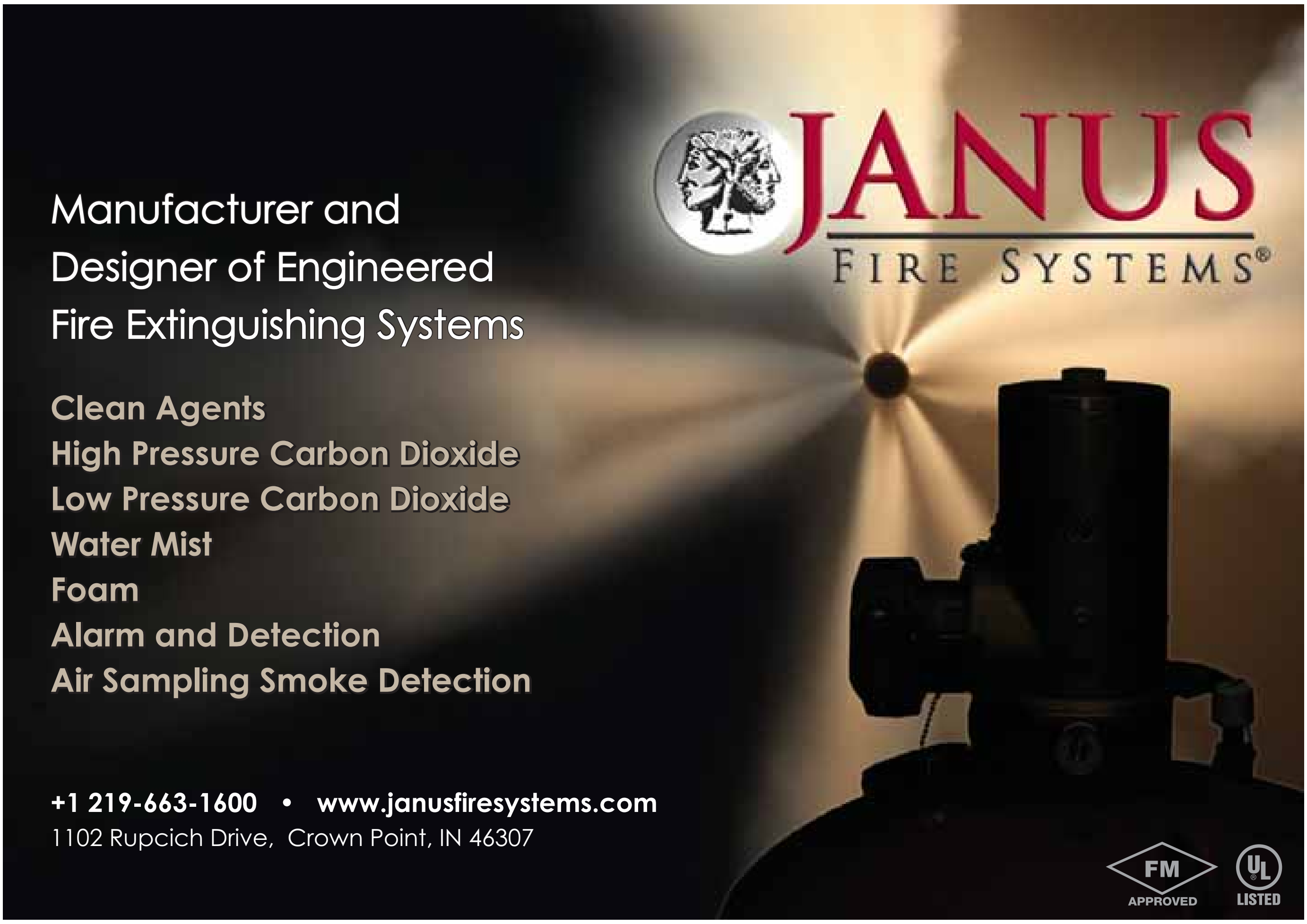
In addition to the advent of less water requirement, many of the water mist suppliers have worked well with design of nozzles and system components, leading to aesthetically favourable installation with thinner pipes, often made of stainless steel, and nozzles integrated into the building.

To promote water mist, the IWMA organises manufacturers and users of water mist and is the leading factor in paving the way for the correct use of these firefighting systems worldwide.

The competitors of the water mist technology have always been, and still are, traditional sprinkler systems and systems using powder or gas to control or extinguish fires. However, in many surroundings, water mist systems are an alternative; sometimes even the better choice. It is therefore important to have a close look at all available systems to choose whatever is best. And given the chance, water mist systems can definitely stand up for themselves. **APF**

**Ragnar Wighus** is Chairman of the International Water Mist Association.
**Bettina McDowell** is Association Secretary

For further information, go to www.iwma.net



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## New Gas Powered Concrete Rescue Saw

The New CE94CRS Gasoline Powered Concrete Cutting Chainsaw cuts reinforced concrete up to 16-inches thick and cuts it up to 40% Faster with the new CE7COI™ Diamond Chain that features diamond cutting segments on every chain link – up to 30% more diamond cutting surface area in contact with the concrete being cut.

## New Rotary Rescue Saw

The CE970 H$^1$ Series Rotary Rescue Saw has a new, more powerful 94cc engine for high performance cutting. A new Air Filtration System, incorporating a special waterproof K&N Filter, assures outstanding performance in all cutting conditions. Exclusive Black Diamond and Black Star cutting blades cut a wide variety of materials.

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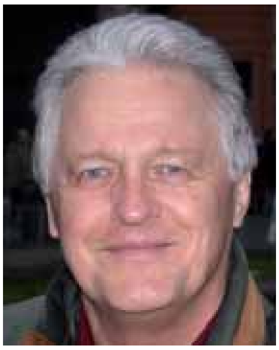


**Graham Collins**

# Making the Cut

Selecting the right rescue saw can, literally, mean the difference between life and death for the trapped victim. In this Buyers' Guide we aim to show what is new on the market from the leading brands around the world

## Ripping Success

VentMaster chainsaws from TEMPEST are designed specifically for firefighters and the daunting demands that come with the job.

Cutting tools in the fire scene must be able to cut a wide array of materials, often while running full-throttle in extremely harsh conditions such as high heat and thick smoke. These scenarios can destroy a standard chainsaw. Equipped with the Husqvarna Pro X-TORQ 576XT or 365XT power head, VentMaster cobalt guide bar and Raptor carbide chain, VentMaster chainsaws are able to rip their way through everything from car bodies to green trees. The saw's exclusive air filtration design allows it to tackle all of this even while taking in heavy smoke, heat and debris.

The X-TORQ power head increases torque up to 20 percent over a wider rpm range for maximum cutting power. The Husqvarna power head features larger displacement, the highest fuel economy in its class, higher peak power and far superior ergonomics. An exclusive air-injection, centrifugal force air cleaning system eliminates the need for expensive external aftermarket filters. Preliminary air intake cleaning rejects 97 percent of cutting residue and other airborne debris including drywall dust, concrete dust, smoke and even water spray. Cleaner intake air means longer intervals between filter cleanings, longer runs at full power, longer chain life, smoother operation and reduced internal engine wear.

Cobalt alloy inserts featured on the end of the guide bar provide fantastic wear, galling, and impact resistance. The properties are retained even at high temperatures. The Raptor carbide chain features an "open dual-raker" design protecting the cutters and allowing greater cut control. Tough enough to cut through tar, asphalt roofing, nails, sheet metal and wire enforced belting, yet versatile enough to cut trees and green wood.

The tool-less KIS-40 depth gauge is fast, simple to install, adjust and remove and eliminates the need to "roll the rafters". Accurately control cutting depth protects the operator and performs speed cuts safely. A one step start/stop combines the choke, throttle lock and stop switch, eliminating flooding and allowing fast, convenient starting. VentMaster chainsaws feature easy one push positive stop, even when wearing gloves.

**For more information, go to www.tempest-edge.com**

# New Technology Power

CUTTERS EDGE has introduced the next generation engine technology for more power, more torque, better fuel efficiency and 75 percent fewer emissions to its line of fire rescue saws. The new Stratified-Charged Dual-Air intake engine technology significantly improves overall cutting performance and meets all Air Quality Control standards at the same time.

In addition to the new engine technology, Cutters Edge also added reflective labels on all saws and offers an illuminating handle option to help see the saws and operators in dark and smoky conditions.

Designed specifically for the fire and rescue industry, the new 2100 Series includes two engine sizes: 70.7cc and 87.9cc. Each engine is designed for use with the Cutters Edge carbide-tipped bullet chain and will cut the widest range of materials found at a fire ground and rescue scenes. The bullet chain's unique design and filing action cuts faster and lasts up to 20 times longer than standard chains. Certified tests show it is the safest carbide-tipped chain, with "extremely low kickback".

Cutters Edge exclusive external multi-stage air filtration system enables its saws to run up to 12 times longer in hot (up to 593°C) and smoke filled environments and a full-wrap handle ensures high performance cutting in any position.

The new $H^1$ Series is engineered and powered to work harder and operate longer in the most extreme fire and rescue conditions throughout the world. The new technology engine is available in three sizes: 74cc, 94cc and 119cc. A multi-stage air filtration system maintains smooth, continuous performance in any condition and an optional full-wrap handle assures high performance cutting in any position.

Two High-Performance Diamond Cutting Blades are available on the $H^1$ Series. The Black Star and Black Diamond offer a choice of longer cutting life, 150 to 300 times longer than standard blades, and high speed cutting of virtually all materials. An advanced vacuum brazing process permanently fuses the cutting diamonds and exposes 30 percent more diamond cutting surface for faster cutting and longer life.

Cutters Edge's new CE94CRS gasoline powered concrete cutting chainsaw is powered by a new technology 94cc engine and cuts reinforced concrete up to 40.64cm thick with its diamond chain. The new lighter weight Powerhead and redesigned full-wrap handle enables high performance cutting in any position and the waterproof air filtration system assures dependable performance in any conditions.

A new diamond cutting chain, the CE7COI diamond chain, features diamond cutting segments on every chain link – for up to 30 percent more diamond cutting surface area in contact with the concrete being cut. The CE7COI diamond chain cuts substantially faster, has significantly less vibration and excellent longevity.

**For more information, go to www.cuttersedge.com**

# Husqvarna K970 Rescue

## You can count on it !

The Husqvarna K970 Rescue is specially designed for rescue and clearing work. It has a unique power-to-weight ratio and is equipped with features like the new generation Active Air Filtration™, one of the market's most efficient centrifugal air cleaning systems that offers up to one year's operation without a filter change and SmartCarb™, abuiltin automatic filter compensation and a highly efficient vibration dampening system.

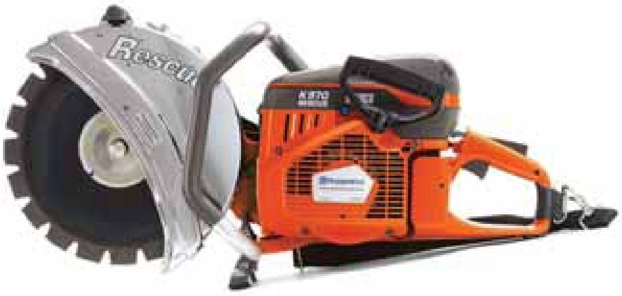
The K 970 Rescue has a robust DuraStarter™starter and an extra large starter handle with space for bulky gloves. Control of the cutter is facilitated by the chromium-plated blade guard that is visible in smoke and water spray and the adjustable carry strap allows for maximum freedom of movement.

The K 970 Rescue is equipped with an X-Torq®engine, which reduces emissions up to 75 % and lowers fuel consumption by 20 %. Air Purge and a decompression valve make it very easy to start.

*Adjustable carry strap allows full freedom of movement*

*Specially designed starter handle, with room for heavy gloves.*

*Chromium-plated blade guard, visible in smoke and water spray, enhances control of the cutter.*



*Husqvarna K970 Rescue-94cc, 4.8 kW, 350mm diamond blade*

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# High Power Reliability

The SUPER VAC Power Pro SV3 ventilation saw is a high power, reliable chain saw made for venting and rescue operations. This chain saw is available with either a 406 mm or 508 mm bar and is powered by a 5.7 horsepower Dolmar engine. This 78.5 cc engine features the new SLR function that lowers emissions for a cleaner environment.

The SV3 also features a three-stage heavy-duty air filter that is proven during the smoky conditions in which a firefighter will be working. The full wrap handle and .404 heavy-duty carbide chisel chain makes this saw quick through the cut. It is easy to handle and tough enough to tackle a variety of operations, including cutting through residential roofing, removing downed trees, and ripping through various building materials.

A D-ring handle makes it easy to start while wearing multi-layered rescue gloves. A scrench tool and holder on the saw makes for quick adjustments and the front faceplate deflects debris. A quick start compression release and an "always on" ignition ensure the SV3 is ready to go when you are.

Super Vac reckons to be the only manufacturer to offer two different style depth guards. A full wrap style comes standard for extra safety and a quicksilver open style is available if you are looking for the lightest depth guard on the market. Additional accessories are available to help make the SV3 Power Pro chain saw the perfect ventilation chain saw for the fire and rescue industry.

**For more information, go to www.supervac.com**

# Outstanding Gem of a Blade

The FR3 diamond blade from HUSQVARNA has a single layer of vacuum-brazed diamonds that ensures outstanding cutting performance in a wide variety of materials.

It can be used with confidence to cut metal, concrete, stonework, brickwork and blockwork and is especially recommended when free cutting is a critical requirement of any material, including steel. It can also be used to cut ductile iron, Plexi glass, rubber, timber, glass-fibre, rebar and PVC.

The FR3 diamond blade offers superior cutting speed and is safer to use than abrasive discs in power cutters and angle grinders when undertaking either fire and rescue or urban search and rescue operations.

**For more information, go to www.husqvarnacp.com**

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Saturday, August 25, 2012 – Fire rises over the Amuay refinery near Punto Fijo, Venezuela. The huge explosion rocked Venezuela's largest oil refinery, killing 48 people and injuring dozens.

AP Photo/Ariana Cubillos

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# Refinery Cable Tray Protection

One of the most significant fire protection requirements for refineries and other offshore locations is the need to protect control cables and control valves in the event of a fire. Several alternatives are on the market, including fire blanket systems, calcium silicate board, and flexible mats that absorb heat in the event of a fire. Each has its benefits and refinery operators need to weigh up the pros and cons of the available cable fire protection solutions to ensure that they select one that is the best for a particular application.

**Clay Booth**

Morgan Thermal Ceramics

American Petroleum Industry (API) 2218, Fireproofing Practices in Petroleum and Petrochemical Processing Plants, provide guidelines for ". . . selecting, applying, and maintaining fire proofing materials that are designed to limit the extent of fire-related property loss in the petroleum and petrochemical industries." Separating refinery operations into fire zones that can be isolated and safely shut down is a key objective, so if a fire breaks out, the flow of the product being refined does not feed the fire.

The API 2218 guidelines include a variety of protective measures, including fireproofing to improve the capacity of equipment and its support structure to maintain their structural integrity during a fire. Shielding essential operating systems when they are exposed to fire is another important measure.

To protect the refinery and its components, the standard requires control valves that turn off the flow in the event of a fire, along with control cables that signal when to shut off the fuel. Under the API standards, this control valve and cable must itself be able to withstand a fire, usually for 20 minutes, but in some circumstances for 30 minutes or more. Examples of cable tray systems designed to protect the cables from fire include:

- Vendor-certified fireproofed cable tray systems.
- Standard cable trays completely enclosed with insulating, fire-resistant fibre mats, or endothermic mats.
- Cable trays encased with calcium silicate insulating panels with calcium silicate sleepers to hold cables away from bottom of the cable tray.
- Trays with exterior surfaces made of galvanised sheet metal coated with mastic or intumescent fireproofing material.

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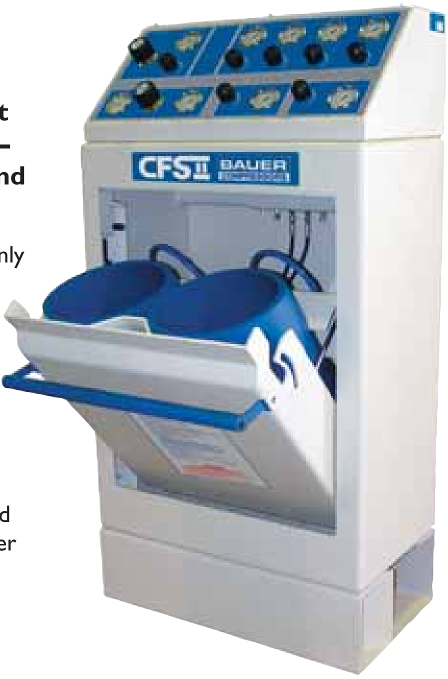

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The material used to provide 30-minute fire protection against a hydrocarbon pool fire for grouped electrical cables inside conduit or a cable tray must be tested before installation, using the ASTM E 1725-95 method, Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components. The method is based on a model of the type of fire that could happen at a refinery; one that gets to 815°C at three minutes, and between 1010°C and 1177°C after five minutes. Testing is carried out in accordance with hydrocarbon pool fire temperature-curve conditions outlined in ASTM E 1529 (50,000 +/–2,500 BTU/ft$^2$hr).

The test is run at positive pressure over at least half the test assembly. Thermocouples are arranged in sets, with thermocouples peened every 150mm on both rails of the cable tray, and every 150mm on a bare copper wire centred in the tray. The cable tray is intended to be run empty of cables, which provides approval for zero to 100 percent cable loading. Failure is determined when one "set" reaches an average temperature rise of 121°C, or any single thermocouple reaches a temperature rise of 163°C.

## Options for Meeting Fire Protection Standards

A wide range of options are available to protect control valves and grouped electrical cables against extended exposure to fire and maintain control of equipment operated by the cables.

One option involves wrapping cable trays and conduits with a non-flammable high temperature resistant insulating blanket. The fire exposure period is rated in proportion to the wrap thickness and the material is typically weatherproofed in the field. For example, the FireMaster 607 blanket is a flexible blanket composed of high temperature fibres classified for applications to 1200°C. The core fibres are manufactured using the Superwool fibre technology, which uses a low bio-persistent insulating wool, reducing the risk for installers.

The blanket wrap system consists of a single layer of 50mm material and is designed for up to 300mm cable trays and conduits. The lightweight flexible blanket wrap is easy to cut, reducing installation problems in complex designs. A simple wrap design allows easy re-entry for cable modifications. The insulation is supplied with full encapsulation in a glass fibre reinforced foil and polypropylene (FSP) facing as standard, to provide

**Clay Booth** is Fire Protection Market and Sales Manager at Morgan Thermal Ceramics

For further information, go to www.morganthermal ceramics.com

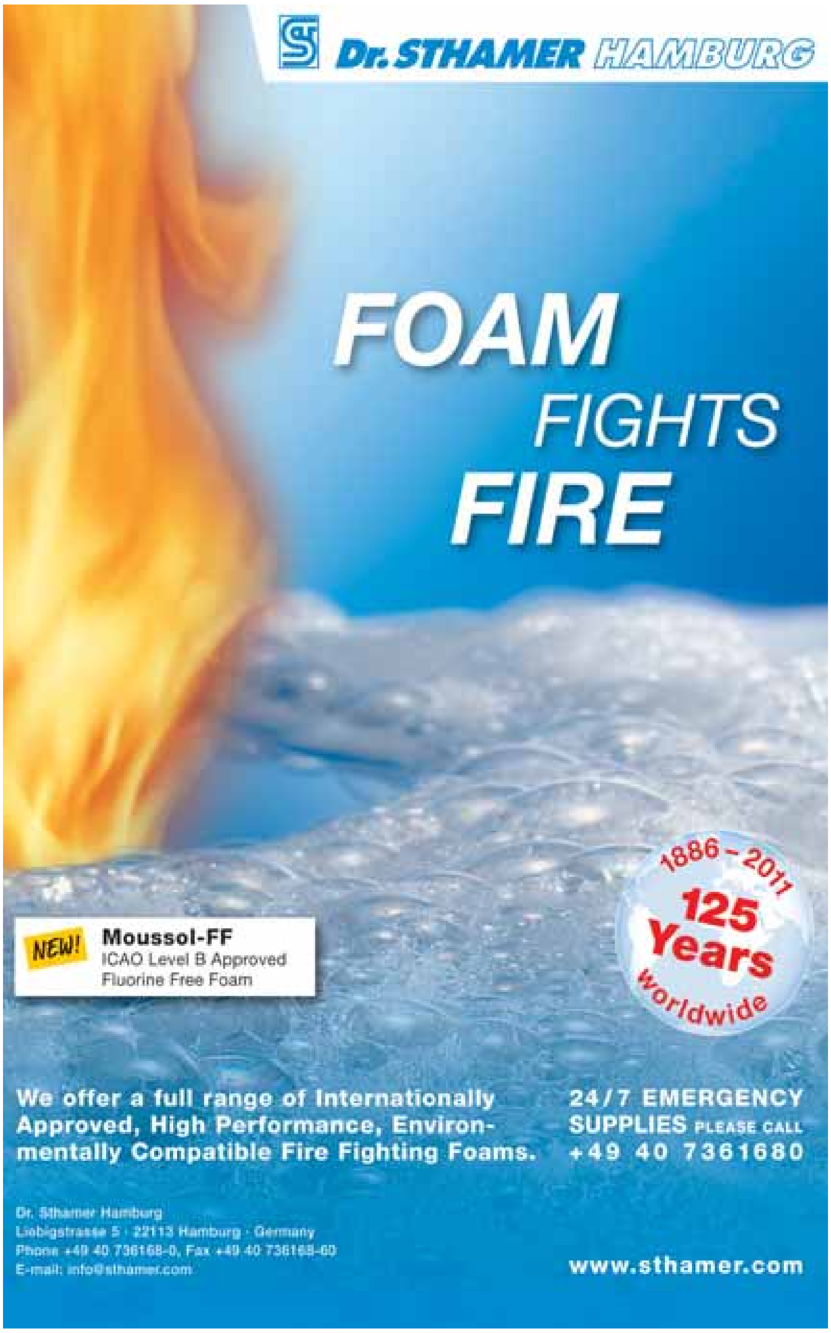
superior handling strength for installation. Optional weather and mechanical abuse protection may be added. The FireMaster fire protection system results in significant material cost and labour savings compared with composite products or rigid board installations. It is also lightweight, preventing the need for additional support structures and associated costs.

The blanket wrap system has achieved third-party certification through Factory Mutual (FM).

Another available option is calcium silicate board, an inorganic, non-combustible high temperature insulation. The material can offer some weather resistance and durability in many environments, but it can be heavy, which together with the cutting and fastening methods required, makes it relatively difficult to install. In addition, while the board itself is relatively inexpensive, the waste from cutting and the additional labour required for cutting and fastening makes it expensive to install. It is also less adaptive to complex cable tray runs.

A third option is an endothermic mat (e-mat), which protects structural steel, cable trays, and conduit circuits by chemically absorbing heat energy, blocking heat penetration. The product requires the installation of between three and five layers, resulting in increased weight and material costs – up to five to ten times higher than insulation or board alternatives. These multilayer solutions also have additional labour costs. On the plus side, flexible mat solutions are not as insulating, so they can often be used to protect power cables, which generate heat. The other options discussed are more appropriate for use to protect control cables, which do not generate a significant amount of heat.

The intent of petroleum industry standards is to separate refinery fire zones by enough distance so that if a fire breaks out, it is possible to turn off the flow of chemicals, oil, or gas to the affected area so the fire does not feed itself. In that scenario, the cables and valves controlling the shut-off valves must be adequately protected. When selecting the most appropriate options to maintain control over these components, be sure to evaluate the total material costs, labour and installation costs, durability under the particular facility's location, and any associated differences in long term maintenance and replacement costs. APF



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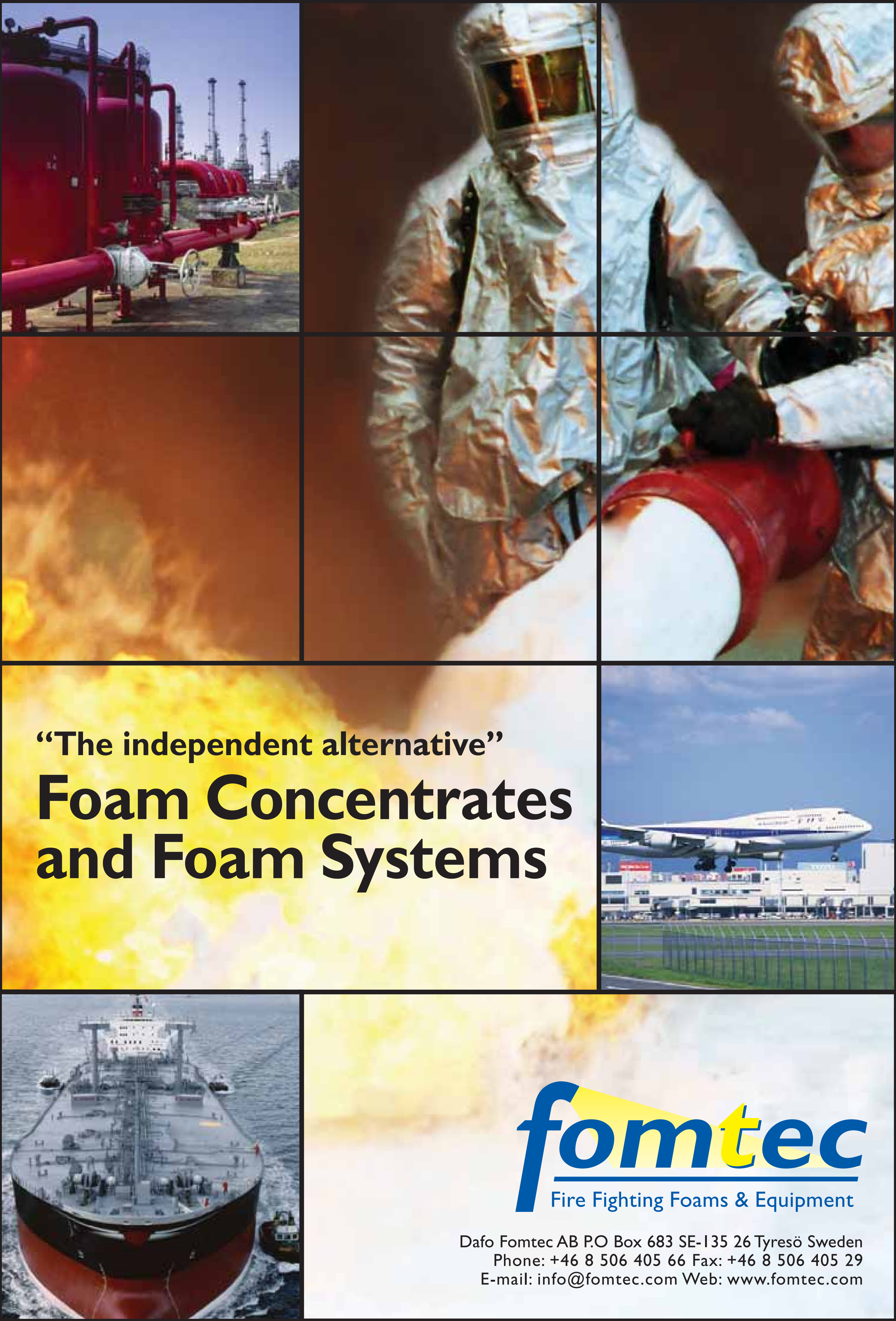
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# Fire Protection for Asia Pacific's Logistics Operations

**Scott Starr**

Firetrace International

The Asia Pacific region is today the powerhouse of international trade, so much so that many of the logistics and handling industry's decision makers are taking the threat that fire poses more seriously. The risk to the efficiency and reliability of intermodal transportation is so great. But how is this safety reliably achieved?

The worldwide growth of consumerism and the globalization of business in the past handful of decades have been made possible, in part at least, by a revolution in the way in which freight is transported across the world. The success, or otherwise, of these highly-containerized operations has an undeniably swift and significant impact on the economy of every developed country. So, it is false economy in the extreme to put at risk the smooth running of these operations by failing to provide essential equipment with adequate fire protection.

The risk is the possible complete disruption of logistics operations, the very real prospect of injury or death of employees, significant revenue losses due to unscheduled downtime, the loss of expensive equipment that can easily take months to replace, and customer satisfaction levels that can plummet.

Perhaps nowhere is the risk so evident than in the Asia Pacific region, where the transportation of goods has, in recent years, reached unprecedented levels. The statists tell a compelling story. Of the top busiest and largest ports in the world, a staggering nine of the top ten are in the Asia Pacific region. They are, in descending order: Shanghai; Ningbo-Zhoushan in China; Singapore; Tianjin, Guangzhou, Qingdao, Qinhuangdao Port and Hong Kong – all of which are in China; and Busan in South Korea. Rotterdam in the Netherlands is the only non-Asia Pacific port to be in the top ten.

According to research conducted in 2012 by Frost & Sullivan, sea freight is the key transport mode for freight movement in Asia Pacific, handling more than 60 percent of the total freight traffic in Hong Kong, Singapore, Australia, Japan, Taiwan, South Korea, India, Malaysia, Thailand, China, Vietnam and Indonesia. This is expected to grow at a compound annual growth rate of 7.6 percent between 2011 and 2016, to reach US$4.09 trillion in 2016.

But just how real is the fire risk in mobile equipment?

The answer is very real; far more frequent and often far more devastating than you might expect. For example, one of the leading international transport and logistics insurers is on record as acknowledging that mobile equipment fires are widespread at ports and terminals. In a two-year period, this company alone received no fewer than 50 claims for hydraulic fires in mobile equipment. According to its records, straddle carriers, cranes and lift trucks account for just short of 80 percent of claims. Significantly, this dwarfs the number of claims made for fires in logistics buildings where almost certainly the majority have some sort of fire detection or fire suppression equipment fitted.

### What is the Fire Risk?

With such a wide range of equipment to protect, it is perhaps understandable that the task can appear daunting, embracing as it does everything from port operations to road and rail transportation. In modern ports, mobile logistics equipment spans from rail-mounted straddle handlers to container cranes, wheeled cranes to gantry cranes, stackers to container handlers, and lift trucks to heavy fork lifts.

**Mobile logistics equipment spans from rail-mounted straddle handlers to container cranes, wheeled cranes to gantry cranes, stackers to container handlers, and lift trucks to heavy fork lifts. However, they share the most frequently occurring fire risk areas. All have engine or motor compartments, battery compartments, high-heat sources such as transmissions, torque converters and braking systems, and high ignition potential areas such as belly pans, hydraulic/fuel pumps and high pressure hoses.**

However, the reality of the situation is that these pieces of mobile equipment have many characteristics in common. They share the most frequently occurring fire risk areas. All have engine or motor compartments, battery compartments, high-heat sources such as transmissions, torque converters and braking systems, and high ignition potential areas such as belly pans, hydraulic/fuel pumps and high pressure hoses.

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That these are the main risk areas are borne out by research conducted by the US Department of Homeland Security's NFIRS [National Fire Incident Reporting System] and the NFPA [National Fire Protection Association]. Their study showed clearly that mechanical and electrical failures or malfunctions account for the majority of mobile equipment and vehicle fires – around 60 percent in the case of off-highway equipment. The study further concluded that the most common location for the outbreak of a fire – again in something like 60 percent of the cases – is in or around the engine compartment, the running gear or wheel areas.

In addition to fuel and the risk of fuel-line ruptures, there are any number of flammable liquids present throughout a piece of mobile equipment's engine compartment. Depending on the particular piece of equipment, these include oil, hydraulic, brake, automatic transmission and power steering fluids, plus combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source. Many of these fluids are pumped under high pressure near hot engine, transmission, braking and electrical components.

Additionally, the payload carried by some pieces of mobile equipment and the terrain in which some operate means that some of the combustible materials found in or around engine compartments are freight specific. These can include agricultural crops that, surprisingly perhaps, account for around 15 percent of the items first ignited in a fire, together with sawdust and wood chippings.

## Solution Check List

The vast majority of these high risk areas are either in cabinets, compartments or enclosures or within what is often referred to as a "micro-environments". This is very significant in fire protection terms as it means that these high fire risk areas can be given dedicated and very effective fire protection. But to be a practical solution to the fire safety challenge in this type of mobile equipment, the system must have a number of characteristics. These can be summarized as:

- The solution should combine both fire detection and fire suppression in a single, integrated package.
- It should respond to a mobile equipment fire with proven 100 percent reliability.
- It has to deliver around-the-clock reliability, as this type of equipment is frequently in operation 24 hours a day, seven days a week.
- The system must provide unsupervised, automatic protection. The solution must not require manual intervention.
- The solution must have proven high immunity to false alarms if expensive stoppages and unnecessary suppression discharge is to be avoided.
- The system must be robustly engineered to contend with harsh conditions that can include severe vibration, dust, debris, salt water environments and airflow around the protected compartment.
- It must be able to withstand extreme temperatures and wide temperature variations.
- The system must stop a fire precisely where it breaks out, before it takes hold and spreads to engulf the entire piece of equipment.
- Finally, the solution should require no external power.

While several systems are marketed as being able to provide fire protection for mobile equipment, the majority fall short of these essential characteristics in various ways. For example, some are suppression-only systems that need to be linked to a detection system; conversely, others only detect a fire, and so need to be integrated with a suppression system. Both are unnecessarily expensive options.

Other options sometimes put forward require a power source, with the unavoidable possibility of failure that would render the system useless, while others fall down when it comes to their high incidence of false alarms, the considerable space and weight associated with suppression agent storage, the need to embark on extensive suppression agent clean-up after discharge, and the risk of agent discharge actually damaging sensitive electrical equipment or causing corrosion.

## Proven Solution

The only system on the market that overcomes all of these challenges is an automatic tube-based system called Firetrace, which has already been adopted to protect this type of mobile equipment and on-highway and off-highway vehicles. Indeed, such is its proven reliability that, despite there being over 150,000 Firetrace installations around the world, there has never been a single instance reported where a properly installed and maintained Firetrace system false alarmed or failed to suppress a fire. This reliability is underpinned by an array of international standards. Firetrace is the only UL [Underwriters Laboratories] listed and FM [Factory Mutual] approved tube-operated system in the world that is tested as an automatic fire detection and suppression system.

For example, Firetrace systems have been successfully retro-fitted to protect the engine compartments of Liebherr and Gottwald cranes following a costly and disruptive fire. Similar Firetrace systems are also safeguarding heavy ore-moving crawler equipment at open-pit mines, in five-high container stackers and in rail stackers that are used for loading containers onto rolling stock.

## Integrated Detection & Suppression

Firetrace is a linear pneumatic fire detection and suppression system that is not plagued by the major drawbacks and shortcomings of other technologies put forward for the protection of mobile equipment.

It is a self-contained system that, significantly, requires neither electricity nor external power; an intrinsically safe solution that is activated automatically around-the-clock, without the need for manual activation or monitoring, and requires virtually no maintenance. Firetrace comprises a cylinder containing a suppression agent – in most mobile equipment applications this is ABC dry chemical powder – that is attached to a purpose-designed proprietary Firetrace Detection Tubing. This leak-resistant polymer tubing is a linear pneumatic heat and flame detector that is designed to deliver the desired temperature-sensitive detection and delivery characteristics.

This Firetrace tubing is routed throughout the areas to be protected and, when the tubing is exposed to heat and radiant energy from a fire, it ruptures and instantly directs the suppression agent at the source of the fire.

While ABC dry chemical powder is commonly used for protecting engine compartments due to its ability to suppress Class A and Class B fires (Class B and Class C in Europe, Australasia and Asia) Firetrace systems are also available that use the latest clean agent technology, 3M Novec 1230 Fire Protection Fluid and DuPont FM-200. Both enable end users to embrace sustainability and minimal environmental impact; they are non-corrosive and non-conductive agents that are listed in appropriate codes and standards such as NFPA 2001:2012 (Standard on clean agent fire extinguishing systems) and BS EN 15004:2008 (Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance). **APF**

**Scott Starr** is Director of Marketing at Firetrace International

For further information, go to www.firetrace.com

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# Shanghai Challenge

**Ming He**

Xtralis

Shanghai South railway station and transport hub is a landmark building in China and is a modern, combined railway, metro and bus terminal complex. It was designed for over 10,000 people at one time, but significantly higher during peak seasons, and in 2005 was the largest transport hub in China with a structure diameter exceeding 260 metres.

Shanghai, like many transit terminals, also serves as a central connecting point to many business activities. Any undesirable and unexpected interruption to the operation of the transit terminals impacts on not just the businesses inside the station but to a much wider community. An ideal fire detection solution in these environments is the one that can:

- Ensure business continuity through very early warning features to facilitate risk (fire) and incident management.
- Satisfy building and life safety design objectives with adequate safety margins and allow for early and orderly evacuation in the event of a fire.

Xtralis approached this project using 1st performance-base design for a large transport hub incorporating advanced air sampling detection technology. Early detection would allow for more commercially useable space and provide sufficient design safety margin to cater for uncertainties without over engineering.

Nowadays, almost all the major transit terminals incorporate innovative architectural design ideas to accomplish visual, energy sustainability and useability goals. Best use of limited spaces from a stand-alone rail station to a mega transit hub with a fully integrated airport, rail, metro and bus terminuses is essential to achieve an optimal commercial outcome while still providing a safe and pleasant environment for the terminal users.

Transit terminals usually have a very high occupancy density with people from all backgrounds. Coupled with a complex floor layout and multiple exiting points, operational needs and access arrangements for human evacuation in the event of a fire, or how to prevent any unnecessary evacuation is a real challenge.

All of the following factors need to be built into the design:

> **Almost all major transit terminals incorporate innovative design ideas to accomplish visual, energy sustainability and usability goals. Best use of spaces from a stand-alone rail station to a mega transit hub with a fully integrated airport, rail, metro and bus terminuses is essential to achieve an optimal commercial outcome while providing a safe environment for the terminal users.**

Many countries around the world have adopted the risk-informed, performance-based design (PBD) to develop and implement a large infrastructure building fire safety strategy. The general approach of such an advanced engineering design involves quantitative and qualitative safety objectives to which a design must comply. Two of the key elements of performance-based design are:

- Permitting innovative design solutions that meet the established performance requirements under the defined risks as well as the likelihood or frequency of consequences.
- Encouraging cost-effectiveness and adoption of new technology.

The ultimate success of a PBD relies on the ability to apply well-defined methodologies to prove, with the support of in-situ evidence, the equivalent (or better) performance in building and fire code compliance.

- **Early and reliable detection is desirable but a challenge:**
  - Incipient fires in enclosed, concealed and dusty spaces that are monitored inadequately or otherwise could develop rapidly.
  - Large open spaces with little compartmentation, tunnels and platform areas where air movement from drafts, air-conditioning and train motion interfering with the normal dispersion of smoke.
  - Uncertainty on fuel loads and combustibles.
  - High airflow and unpredictable smoke propagation.
  - Mixed business use and occupants' profile.
- **Balance of investing today and life cycle cost tomorrow:**
  - Low cost option for 1st installation verses long term reliability and suitability.

> **Many countries around the world have adopted the risk-informed, performance-based design (PBD) to develop and implement a large infrastructure building fire safety strategy. The general approach of such an advanced engineering design involves quantitative and qualitative safety objectives to which a design must comply. Risk-informed, performance-based design promotes innovative solutions and new technology.**

  - Significant cost associated with false and nuisance alarms.
  - Maintenance with "hidden" costs (replacement and liability).
- **Technology-enabled system functions:**
  - Orderly and staged evacuation.
  - Consistently trained staff as an integral part of prevention program.
  - Human behaviour, incident prediction and interaction.
  - Fire services attendance, supported with real-time situational data.
- **Design flexibility to cater for change of operation, occupancy type and load.**

Thus, for Shanghai, very early warning fire detection using advanced air-sampling smoke detection (ASD) system, performance comparison with traditional technologies and features that are used for risk management and emergency response in a large transit system was designed. Computational fluid dynamics (CFD) fire development and smoke movement models were used to quantitatively assess fire safety system design safety margins in various fire scenarios. Coupled with real life fire tests at underground metro platforms, the CFD prediction is used to evaluate challenging issues associated with rail and underground platform protection and the emerging use of integrated fire and gas detection for targeted risk areas to ensure uninterrupted transit operation as a whole.

Risk-informed, performance-based design promotes innovative solutions and new technology. Finding the optimal solutions to satisfy building and life safety regulations and at the same time, meet risk management and business continuity requirements for modern transit terminals remains a challenge for the rail industry. **APF**

**Ming He** is Executive Director, Strategic Projects (Fire & Security) at Xtralis

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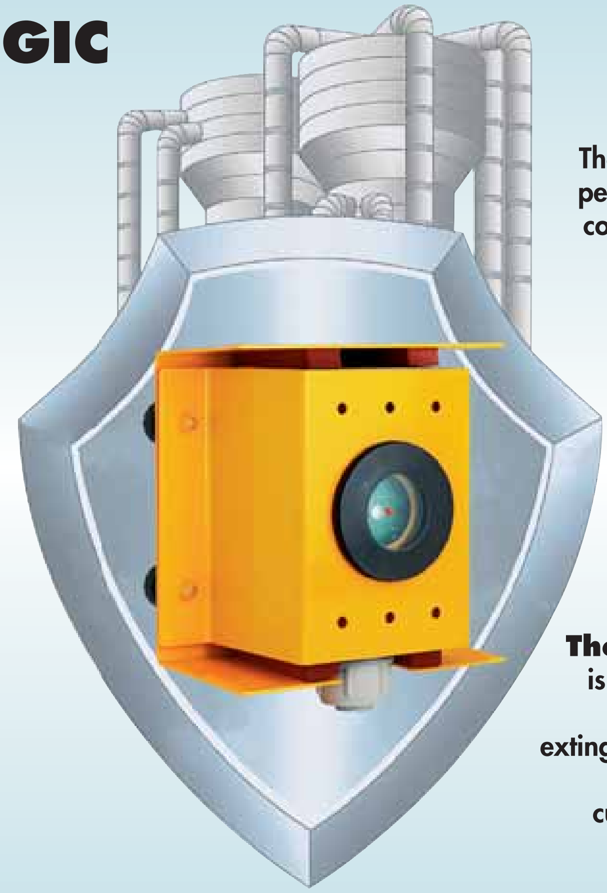

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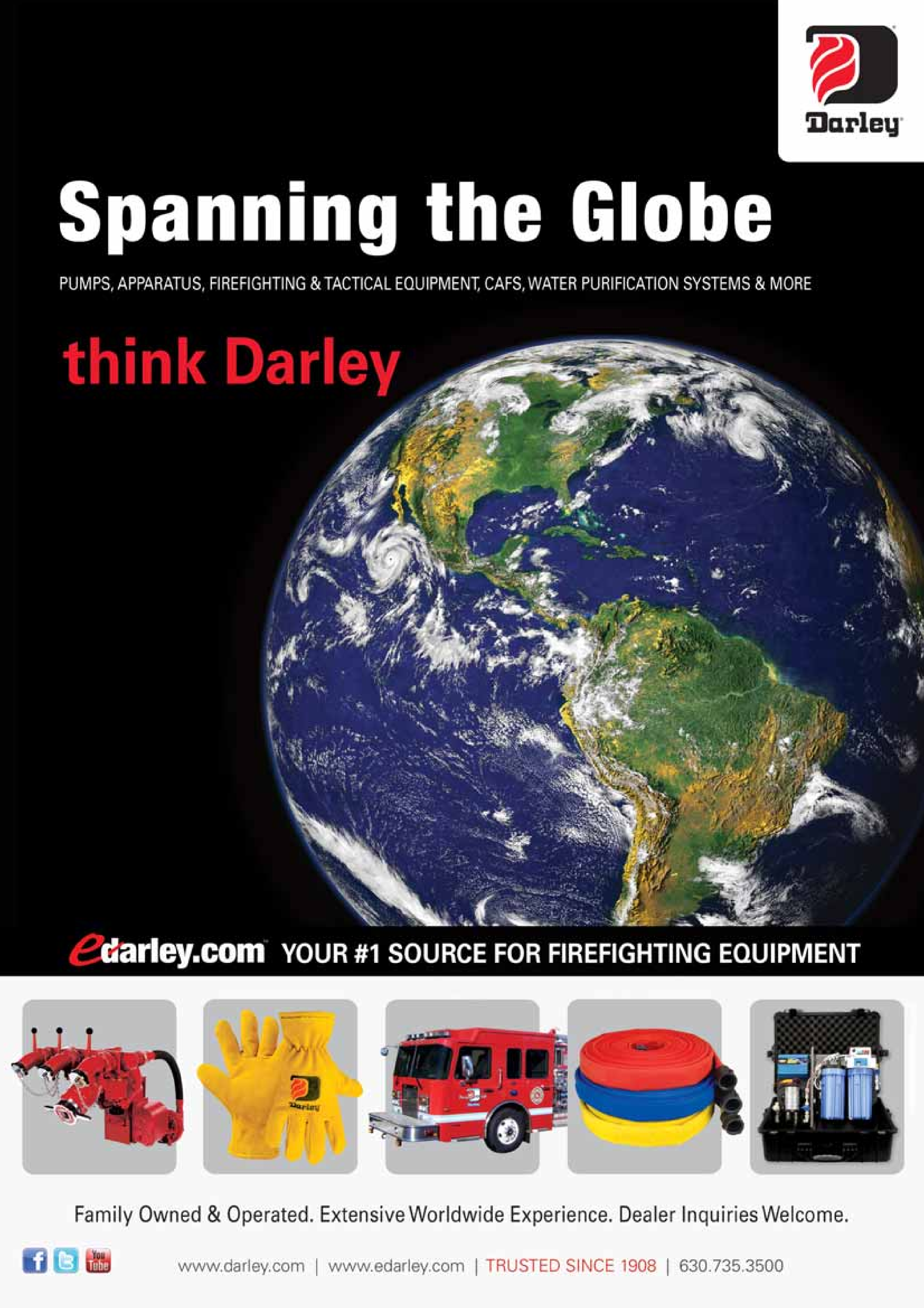

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# Evolution of the High Volume Pump

**Johan Kramer**

Hytrans Systems

High Volume Pumping, and particularly mobile high volume pumping equipment, has developed tremendous the past 20 years.

At the end of the 1980s, Hytrans Systems developed a mobile water supply system that was a water transport system without draft problems. The high volume (submersible pump) was called the HydroSub, which basically is a hydraulic-driven submersible pump that is fed via 60 meters of hydraulic hose and a diesel driven power pack. This enables the submersible pump to be hand carried to locations where it is impossible to use standard suction pumps due to the limited length of the suction lines.

Although developed in cooperation with the Dutch Home Office, its main task was providing firefighting water and, as such, the system needed to be mobile and had to be capable of being deployed with a minimum amount of effort and time and as few personnel as possible. Quick deployment is usually not a necessity during floods, but it does come in handy when a number of smaller flood planes or cellars need to be emptied. The standard system HydroSub 150 will provide 3500 liter a minutes, with a pressure of 10 bar. This means that transporting this amount of water can be done over more than 2500 meters through a single 150mm hose and still have enough pressure left to fill a tanker vehicle.

Preventing a flood is, of course, always the best option, but unfortunately there will always be a flood in some place where it was not expected. Flooding can have a serious impact on both the economy and the environment of any country; it disrupts businesses by blocking roads, floods offices, damages or destroys vehicles. The water is often contaminated and this presents a real danger to the environment and the public health. To minimise the impact, reducing or clearing the effects of a flood is of prime importance and the right material needs to be selected to help achieve this.

The problem when trying to drain a flooded plain is usually access to the water; roads may have been damaged or become unstable, preventing big stationary pumping systems from being transported to the location by heavy trucks. Another problem is that most pumps rely on a suction line that connects the water to the pump. Sucking water has its limits and a maximum draft of 7.5 meters is the result.

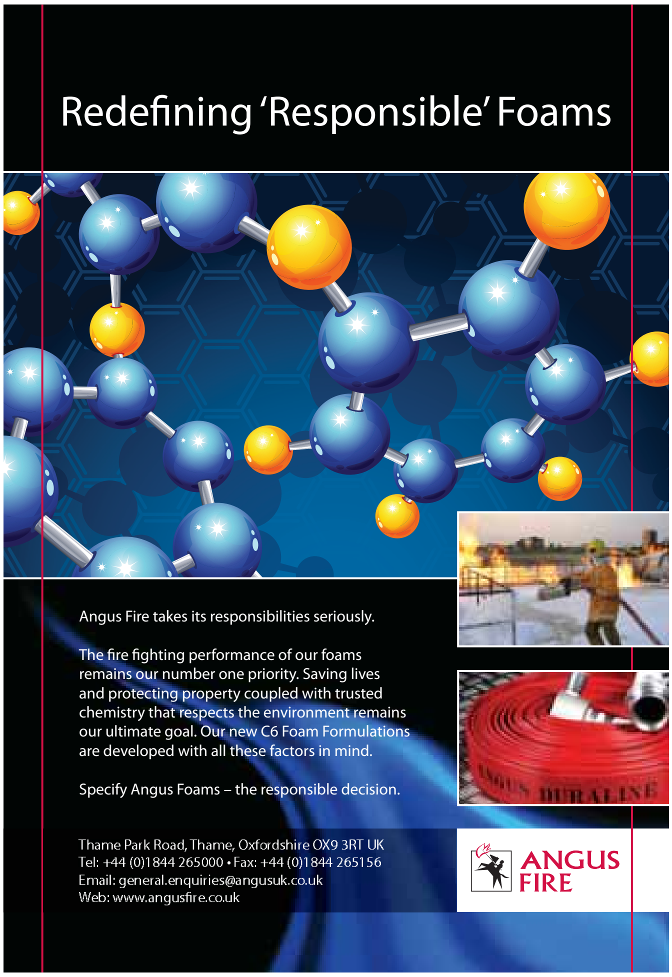
Due to the increasing demand for mobile super high volume pumps, to reduce the impact of floods, the Flood Module was developed as an add-on system for the HydroSub 150. This allows the same HydroSub 150 to drive three flood pumps and generate a capacity of 50,000 litres a minute (lpm). This entire system – Hydrosub and Flood module – fits into one frame and can easily be transported and handled by means of one prime mover with a hook arm facility.

Because of its flexibility and the fact that it is a total solution, in addition to the pumps, hose layers, hoses and hose recovery unit are used increasingly by industrial firefighters, appreciating the advantages of mobile high volume water transport systems. The Hytrans fire system has proven to be very effective during incidents such as the Buncefield oil terminal fire in the UK, the Dalian pipeline explosion in China and, recently, the Fukushima Nuclear reactor disaster in Japan. This is due to their high capacity, quick deployment, easy operating, modular configuration and flexibility. Furthermore they can also be used as a backup system if the fire main is under construction or shut down for maintenance. With a mobile system standby the production does not have to be stopped and safety is guaranteed.

*HydroSub 150 with a 50,000 lpm Flood Module*

Besides a fast deployment, it is also a "must" to recover the system quickly. Most firefighters say that once the fire is extinguished they have all the time in the world to recover the used equipment. However if you look at training on the system, it is essential to make recovery quick and easy. When training is easy, it will be done more often and this will lead to more skilled people. The more training the better prepared for action during a real incident.

As storage tanks increased in diameter the demand for more water and higher pressure grew with it. This resulted in not only the development of much bigger pump units, but also in enlarging the diameter of the hoses to reduce friction loss over long distance; hose recovery units that are able to handle large diameter hose up to 300mm.



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The largest unit in the Hytrans fire system product range at the moment is the HydroSub 1200, which has a capacity of 30,000 lpm at 12 bar. Due to the use of hydraulic driven submersible pumps there is no draft loss and therefore this capacity is also reached at a pump lift of 15 meters. The 60 meter of hydraulic lines allows you to get to the water in almost any situation.

As mobile high volume pumps are more and more used for direct firefighting it was necessary to develop a foam injection unit that is very accurate and can deal with these high flows. The PowerFoam can be either integrated in the large HydroSubs or supplied as a stand alone unit. The latter can be placed at any convenient point in the water line.

Due to the hydraulic driven foam gear pump and the accurate water flow measuring, the exact amount of foam concentrate is added to the water flow. Foam setting can be done from zero and six percent in increments of 0.1 percent. The system works in such a way that it is fully independent from pressure and water flow and adapts automatically if there is fluctuation. Accurate foam mixing is the result. It also features a return line that allows you to return the foam concentrate back to the container during training sessions. Training on the entire foam setting of the unit, as well as the foam logistics, can be carried out without wasting precious and expensive foam.

*HS1200F 30.000 lpm at 12 bar. The inset picture shows the water inlet and foam concentrate connection*

Mobile high volume pumping was, is and will be constantly developing in order to get bigger, better, faster and lighter equipment to help firefighters fulfill their tough job. **APF**

**Johan Kramer** is Sales Manager at Hytrans Systems

For further information, go to www.hytransfiresystem.com

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# USAR Exercise Trials New UN Coordination System

**James Morton**

Hampshire Fire & Rescue

Search and rescue personnel from around the world have taken part in a major international training exercise in the UK.

An earthquake scenario was simulated at Fort Widley, a 19th century defence complex high above the port of Portsmouth in Hampshire on England's south coast. The exercise was hosted by UKISAR (UK International Search and Rescue) and supported by UKAID, an initiative of the UK government's Department of International Development.

Specialist search and rescue personnel from as far afield as the USA, Australia, Belgium and the United Arab Emirates joined over 140 UKISAR team members for the four-day exercise called Exercise Tusker.

Many of the experts taking part had been deployed to recent disasters in New Zealand, Haiti and Japan. In total, more than 200 personnel were involved in the full-scale exercise.

One of the main aim of the exercise was to trial aspects of a new UN coordination system, being developed by the Operations Working Group of the UN's International Search and Rescue Advisory Group (INSARAG). The new methodology aims to strengthen co-ordination systems and standardise search and rescue processes across all countries to achieve better collaboration in disaster zones.

Among the international participants was a specialist USAID co-ordination team from Fairfax County and LA County's USAR team, who specifically simulated the strategic element of the system. A 100-strong UKISAR team and a 35-strong B-FAST (Belgian First Aid & Support Team) contingent from Belgium were able to test the field co-ordination tools in realistic conditions and also test the sector co-ordination portion of the system.

Group Manager, Pete Crook, from Hampshire Fire and Rescue and UKISAR, who co-ordinated the exercise, said: "This was an ideal opportunity for USAR teams to come together and practice in realistic and challenging conditions." He continued: "We can be mobilised to a wide variety of international disaster zones so it is critical that personnel have the opportunity to train in realistic scenarios such as this mock-up of the aftermath of an earthquake."

The participants were able to field test most elements of the proposed new UN co-ordination system for the first time. While this was very successful, it did provide some really useful learning points to improve this further.

Battalion Chief John Boyle, from LA County Fire Department, who has worked recently at earthquakes in New Zealand and Haiti, was among the USAID crew attending the exercise. He said: "We were exercising the new methodology in co-ordination of urban search and rescue teams in a large disaster. This event helped to bring more understanding and awareness of this new methodology of co-ordination, breaking widespread disasters into manageable pieces."

The new methodology has a few key principles that were tested at Exercise Tusker:

- Adding specific USAR co-ordination expertise into an On-Site Operations Coordination Centre (OSOCC).
- Sectorising large incidents using established 'spans of control' principles and deployed teams as sector co-ordinators.
- Standardised and clearly defined 'levels' of assessment, search and rescue activity to achieve universal clarity of the operations being carried out.
- Standard co-ordination tools to be used by all teams to make gathering, sharing and using essential information effective.
- A new marking system as an integrated part of the co-ordination system.

Exercise Tusker followed up a new INSARAG course aimed at improving the standards of international USAR teams that was also hosted in Hampshire earlier in the year. The course aimed to strengthen the INSARAG External Classification (IEC) system by training the key people involved.

The IEC system is a unique process where teams voluntarily put themselves forward for assessment by USAR experts from other countries. This 'qualification' is fast becoming the international benchmark that USAR teams aspire to and reflects the goal of improving the co-ordination of disaster response.

Uncontrolled mobilisation of multiple USAR teams of differing sizes and capabilities to international disasters has previously caused serious problems. But the growing number of UN-classified teams that provide a full range of standardised capabilities and trained to help with coordination appears to be changing this.

Pete Crook, also a member of the INSARAG Operation Working Group, said he was confident that the combination of strengthening the IEC system and an improved co-ordination methodology would leave the international search and rescue community in a far stronger position.

He commented: "Events such as those that struck Haiti and Japan seem to be increasing, not decreasing, and the challenge on the ground gets ever more complex. We received extremely positive feedback from all the participants on how realistic the scenarios were and how much valuable experience they gained from the exercise." He concluded: "We achieved all of our objectives from the exercise and hopefully this will strengthen worldwide rescue response in the future."

The new methodology is being refined and tested further at exercises in the coming year and it is hoped that the final version will be approved by the annual INSARAG Team Leaders meeting in Holland in September 2013. Implementation will then follow but many teams that have seen the draft version have already begun training with it. **APF**

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Exercise Tusker was named in memory of John Taylor, a highly regarded Hampshire firefighter/medic and member of UKISAR who sadly succumbed to leukaemia only months after returning from the Haiti earthquake. Tusker was his favourite beer.

**James Morton** is Senior Communications Officer at Hampshire Fire & Rescue

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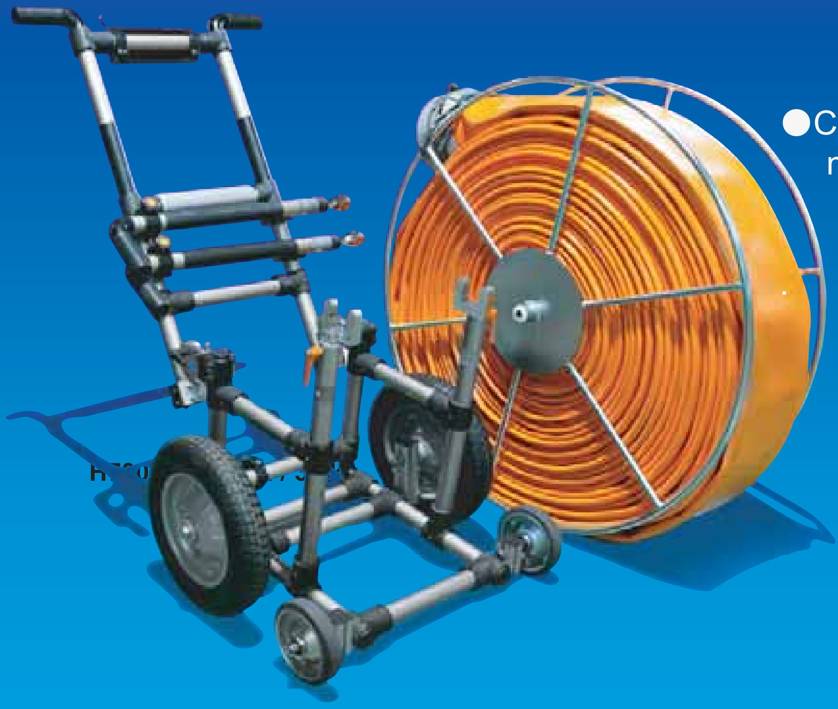

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# Understanding Live Fire Training Systems

Despite continuous efforts to provide a general understanding of what live fire training systems are and the benefits they offer, many organisations are still unsure of what factors to consider when procuring a live fire training system.

**Ruben Keuchen**

Kidde Fire Trainers

A few years ago, fire training meant lighting a collection of leftover wood with unstable fire accelerants that firefighters then had to extinguish. This method was not safe, convenient or environmentally responsible. Modern live fire training systems – or as they are more often called "fire trainers", offer safe, reliable and environmentally sound training for firefighters. As demand for these systems increased, a variety of systems and manufacturers came into the market, typically differentiate by four categories.

## Fixed Structural Training Systems

Structural trainers are systems that can be housed in a variety of structures in order to more realistically simulate a specific scenario for firefighters, ranging from single or multi-storey burn houses to tunnels, ships, aircraft and military rig structures. These training systems typically comprise several fireplaces within the structure with several rig specific mock-ups – for example, kitchen or bed fires in a burn house, galley and seat fires in an aircraft – to simulate certain scenarios typical in that particular structure. The structural trainer is also typically equipped with physical obstacles, smoke machines and sound generators to further replicate the conditions common to a fire event occurring in that particular kind of structure. For example, structural aircraft trainers typically experience fire instances related to fuel spills or issues with the engine or undercarriage.

The fireplaces in fixed structural training systems are fuelled by propane or natural gas, as they are cost-effective and environmentally responsible burning gases. Kerosene-driven systems are also available for ARFF personal but they have a bigger impact on the environment.

## Modular Training Systems

Modular training systems offer similar functionality as structural trainers and are commonly considered to be more economical compared with the permanent burn structures, but have a shorter lifetime due to the nature of their container-based construction. Modular training systems are extremely versatile due to their ability to combine different types of containers and multiple fireplaces. They can also be easily expanded with additional containers and a flexible control system, and are environmentally-sound fuelled by propane or natural gas.

## Mobile Training Systems

Mobile trainers are flexible and designed to bring training to customer locations or multiple training grounds. While these systems are typically self-sustained and equipped with electrical generators and gas tanks, they can also be customised with variants available on-site.

The mobile systems can replicate typical house fires or aircraft fires. In the case of aircraft fires, the entire system can take the shape of an actual, small aircraft. Even industrial fires can be simulated. For example, typical HazMat tanker fires equipped with a training system looking like a generous tanker

and replicate fires scenarios often associated with tankers.

However the flexibility of mobile trainers comes at the cost of a limited training capacity as the area for training is very small limiting the number of fire scenarios. In addition, these systems normally can only be fuelled by propane due to security reasons in transport; the use of natural gas is only possible if the system relies on on-site gas supply.

## Outdoor-Industrial Training Systems

The widest category of training systems is outdoor-industrial training, which replicates fires on raised or multilevel industrial platforms, tank and fuel spill fires, as well as HazMat and vehicle training fires. Trainers of this category offer a variety of mock-ups and fire scenarios and can be combined with additional scenario-specific non-fire effects, such as leaking/decompressing gasses from cylinder valves or manifold failures, plating acid dip tanks and many more.

HazMat training facilities are currently in demand due to the number of HazMat incidents and the many casualties suffered by first responders and firefighters over the past few years. In addition to these four main training system categories, a class of small portable trainers can be used for fire extinguisher training; however, they are not meant for firefighters.

## Finding the Right Fire Training System for Your Needs

The sheer volume of fire training systems available on the market can make it difficult for interested parties to get a good overview. In addition, the systems are typically non-standard products that are customised to fit specific customer demands. However, Kidde Fire Trainers' experience in the industry has helped identify six key points that organisations should take into consideration:

### 1. Define the Training Needs and Resources

Create a list of training needs by profiling the main incidents that firefighters have to face. Also review whether the existing training complies with official training standards, such as ICAO, NFPA and so on.

Once you have identified the profiles, set-up scenarios that reflect these incidents and define which equipment (fireplaces, sound and/or smoke generators) is needed to conduct this scenario. Then compare the defined needs with the available resources (budget, training ground and training staff). In most cases, budget is the resource limiting the success of training.

### 2. Find the Right Gas to Fuel Your Fire Training System

Two kinds of fuels are typically used by fire trainers in the market. Propane is the most common choice as it has been the only fuel choice for such systems for many years. Propane gas also has the advantages of being cheap, clean-burning, relatively safe to handle as well as easy to obtain, store and transport.

Natural gas-fuelled fire trainers were introduced a few years ago and, since their introduction, have become very popular. Natural Gas has many advantages in common with propane; it is cheap, clean-burning, easy to store as well as relatively safe to handle. Its main advantage in comparison to propane is that it is even easier to obtain, as it can be taken directly from the lines of a local gas supplier, negating the necessity of a local storage tank. Nevertheless natural gas also has the disadvantage that it cannot be transported economically, which disqualifies it for use in a self-sustained mobile training system.

### 3. Choose a Suitable Burning Technology

Two main burner technologies are available on the market: water bath and dry burner technology. Water bath fires tend to have a more natural visual appearance as the flames seem to "swim" on the water. However, water bath fireplaces need a constant supply of water for training sessions. The water pan can either be refilled manually after each session or by an automatic water supply system. The water in a fire pan also can freeze during periods with sub-zero temperatures making the system unusable. Water bath fires have a larger impact on the environment as these systems create higher emissions of unburned hydrocarbon and carbon monoxide.

In contrast, dry burner technology does not have the same challenges as the water bath since no water pan is used and the visual appearance of the flames is still very good. These systems can be used in all kinds of environment regardless of ambient conditions. The environmental impact of these systems is lower as combustion air is directly injected into the fireplace resulting in a cleaner burning process. In addition, the constant supply of combustion air negates the necessity for constant ventilation in a burn room, which is necessary for water bath flames. The fact that constant ventilation is not necessary when using dry burner technology allows the heat and smoke to last longer in the burning room preserving the intense conditions for a more intense training experience.

### 4. Choose Your Degree of Control

The control system is the real differentiator of these systems. Typically you can categorise a control system as a manual, semi-automatic or full-automatic control. However, control systems offered by different suppliers can vary widely.

Nearly all suppliers offer an automatic agent detection or automatic agent reaction feature. This feature generally provides for a realistic reaction of the fire to the application of agent. Almost all full-automatic systems offer an interlinked start of fire scenarios. These mechanisms allow for the creation of scenarios where a fire is automatically reignited if a fireplace is not cooled down long enough or where a fire "spreads" over to another fireplace if a trainee does not extinguish a fire within a given time.

What really distinguishes these control systems is the number of adjustable parameters. The Kidde Fire Trainers T-2000 system, for example, allows the user to control a broad variety of parameters to create a number of different training scenarios using the same trainer. The T-2000 model allows adjustment of flame height, width, expansion, and minimum cooling time for flame extinguishing in addition to providing completely pre-programed fire scenarios for each individual trainee taking into account such factors as the specific equipment being used by the trainee.

## 5. Quality and Design of Fireplaces and Mock-ups

The quality of a fireplace is one of the most critical criteria for measuring the overall quality of training systems as it is a key factor in the initial and maintenance costs and return on investment. Two factors mainly influence the quality: the kind of material used and its thickness. Kidde Fire Trainers remains committed to using only stainless or carbon steel of 3 mm thickness for plates and 5 mm for the framework. These quality construction standards allow Kidde Fire Trainers to guarantee that its systems will have a lifetime of at least ten years.

The design of a fireplace is another important factor in measuring the overall quality of training systems. Some manufacturers offer customers nice looking fireplace mock-up designs, but seem to disregard their primary function as trainers. For example, thermocouples need to be integrated in the fireplace to detect agent application to the fire. However if the sensor is placed in a way that it can too easily be seen by the trainees, they can just cool the sensor directly instead of treating the fire in the correct way. Therefore, the optimal design of the fireplace hides the thermocouples in the fireplace.

## 6. Safety

The most important principle of live fire training systems is to provide a safe environment to training participants. Even though most of the systems available on the market are considered safe in general, unfortunately not all companies apply the same safety standards.

When evaluating different systems, make sure that all safety precautions recommended by the manufacturer of your live fire training system comply with local and international regulations. All fire trainers should be manufactured to comply with the very strict DIN 14097 part 2 norm, which regulates the handling of gas fuelled fire systems. Compliance with this standard provides peace of mind that training can be conducted without any serious risks to at the safety of the trainees. APF

**Ruben Keuchen** is Global Marketing Coordinator at Kidde Fire Trainers

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# Thermal Cameras – Getting the Bigger Picture

When faced with a serious fire at ground level, firefighters often encounter great difficulties and exposure to some element of risk. When they are faced with that same fire, high above or below the ground, the physiological demands are much greater and the difficulties and risks are greatly magnified.

**Angus Drummond**

Argus Thermal Imaging

There may be long time delays between a fire commander's chosen strategies becoming a tactical operation on the fire floors. There may be changing circumstances during this delay that require the strategy to be altered. There can be a great demand for manpower to accomplish even the most basic operation and then, where firefighters are working hard, the need to support them in a continued attack on the fire will treble the resources operating on the fire floors.

At the scene of large or major fire incidents it is essential firefighters and commanding officers have second-by-second scene data to enable them to make informed decisions to correctly execute fire fighting tactics. The demand for second-by-second updates has led e2v engineers to develop an essential technology solution for improved incident management of a fire scene.

The Argus LRT system (Long Range Telemetry) has been designed to allow rugged wireless transmission of the thermal image from the camera for remote viewing outside of an incident. The LRT can be easily fitted to an Argus4 camera because the technology is integrated directly into the camera's battery pack. It provides vital situational awareness information for command personnel, reducing the need for firefighters to describe the scene and significantly improving health and safety. Images from the camera feed to the on-scene commander who can also distribute these images via a satellite up-link to the Fire service headquarters. In some fire-ground scenarios, assessing the incident is further complicated by the fact that the fire is underground, in a basement or a tunnel. Because this makes the operation more dangerous, it is even more vital to be able to see live images from a thermal camera within the hazard zone, all camera feeds can go to the same bank of display recorders in the command vehicle where they are available to the on scene commander.

The LRT provides a solution for underground and difficult to reach fires as it enables firefighters to go deep into a building that is on fire, and still send out clear signals. This is extremely useful for the people outside, such as the incident commanders. Not only will firefighters be safer, but the camera enables a clear operational picture in real time.

The camera's telemetry works in any type of situation, from tube scenarios to high rise buildings, and it limits the amount of reconnaissance at the fire scene, as firefighters can now send out real time images as they please, creating a very clear operational picture. The system has been tested by London Fire Brigade within an unused underground station; video was successfully transmitted from three levels down. Similar tests have been carried out by other brigades with successful transmission of video from the camera fourteen stories up from a high-rise building.

The Argus LRT makes use of a technology trialled and tested by military and security forces called COFDM technology, developed by resilient communications provider Cobham Systems. Coded Orthogonal Frequency Division Multiplexing Technology (COFDM) has been developed to provide secure and resilient transmission from A to B. This technology is also described as microwave technology because several signals are sent out that bounce against obstacles, and are then morphed into one clear transmission signal.

The system can still get slightly affected by obstacles, but not to the same degree as other technology, and therefore the image quality received at the other end is much better. Telemetry in the past has been used to good effect in training situations, but it never performed that well in real fire situations. The distance between the transmitter and receiver was too great, and objects such as brick walls and metal bars, would scramble the signal, delivering a very poor image quality.

The new LRT system works on the principle of point-to-point telemetry. e2v built in a transmitter in the Argus camera that transmits to the receiver. The challenge is to get that data from point to point in a reliable manner without interference, which enables the person on the other end to have a very clear view of what is going on. Secure transmission systems such as the LRT have been pioneered by defence and security forces, and some emergency services. e2v tried all types of technology but the COFDM technology, has been the most successful.

As a world-leading technology innovator, e2v has a long history of supplying revolutionary solutions to the world's fire fighting markets. Starting with the Pevicon based Argus back in the 80s, e2v has since introduced the many new cameras, the latest being the Argus MiTIC, a high resolution small format camera. Selling to an ever more educated customer base, e2v continue to revolutionise the market with advanced technological developments. e2v engineers consistently strive to respond quickly to changing customer demands with even greater technological advancements within its cameras. **APF**

**Angus Drummond** is Sales Vice President at Argus Thermal Imaging

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# CBRN: Ensuring the

**Steven Pike**

Argon Electronics

In the past, training firefighters for chemical, biological, radiological and nuclear (CBRN) incidents was relatively straightforward. Today, however, the task is far more complicated. The emergency services are faced with many different challenges and no two incidents are ever the same. This is largely due to the fact that, in recent years, the range of potential incidents has increased considerably, spanning from the dangers of entering meths labs to dealing with the threat of terrorist attacks, especially involving devices such as so-called dirty bombs.

There are many challenges to meet in training first responders to deal with CBRN incidents and, to provide the best service, it is necessary to consider some of the advanced technology now available – in particular, simulation instruments and software – to specify, equip and plan for the most appropriate training techniques. First responder organisations can then ensure that personnel are adequately trained to deal safely and effectively with CRBN threats.

Simulation equipment is now playing a vital role in improving the quality and consistency of training and that role can only become more vital as budgets are tightened and governments are looking for the most efficient and effective options. In Europe, for example, government spending has declined substantially as a result of the financial crisis. With reductions in transnational civil defence spending and resultant changes to organisational structures, the efficiency of simulation training is now more valuable than ever.

Traditionally, CBRN response training has involved trainees carrying real detection instruments, searching for small quantities of simulants and even, in the case of training for nuclear hazards, responding to hand-written signs showing the level of radiation present at a given location. These methods have of course been

# Right Response

useful in training responders to deal with CBRN threats but compared to the options available today, they are unsatisfactory.

For example, using real detectors in training temporarily takes equipment out of service. Worse still, it poses the risk of it being damaged and decommissioned for a far longer time while it is repaired, recalibrated or replaced. There are also personal risks to trainees during exercises that involve simulants of hazardous substances, since even small quantities of this material can pose a real health hazard. As for using hand-written signs as indicators of contamination, this is of limited benefit since it does not allow trainees to develop any understanding of how to handle and use detection instruments or how to interpret the readings they provide. In contrast, the use of simulation equipment has recently provided a much-needed upgrade to CBRN response training and is currently enabling the delivery of a highly efficient, flexible and cost-effective service.

This upgrade is particularly welcome when we consider the range of threats now facing first responders. Take, for example, the rise of methamphetamine laboratories, which put both the public at large and responders themselves at risk. The need to flush out these labs is urgent; in addition to the risk of explosion, there is a serious and constant threat posed to the environment and local residents by the chemical contamination from the hazardous waste of these labs.

Chemical reactions that occur during the manufacture of meth are so toxic that they can produce hazardous vapours that can permeate walls, carpet, plaster and even the wooden structure of the building. Hazardous events at meth labs are on the rise and few of those arrested for manufacturing meth are trained chemists. This adds to the danger because these "cooks", who have little or no chemical training and learn their formulas from other cooks on the Internet, are playing with chemicals that are highly corrosive or flammable.

Some chemicals will react with each other – or even water – to cause a fire or explosion, or emit vapours that that attack mucous membranes, skin, eyes, and respiratory tract. With so many challenges to face, there is an urgent need for responders to be thoroughly prepared and be clear and confident about how to operate their equipment, enabling them to concentrate their efforts on the specific threat in hand.

**Chemical reactions that occur during the manufacture of meth are so toxic that they can produce hazardous vapours that can permeate walls, carpet, plaster and even the wooden structure of the building.**

Using programmable electronic sources, simulation training systems are capable of simulating a wide range of threats. In each case, the exact functionality, look and feel of real life in-service equipment is replicated, making it easy for trainees to transfer their knowledge from the training centre to the field of operations.

The ease with which these simulations can be set up significantly increases the efficiency and flexibility of training exercises, allowing instructors to simulate a wide range of realistic scenarios. In the UK, Argon Electronics supply the nation's emergency responders and armed forces with simulation equipment that enables them to regularly run training courses that include very realistic exercises. By delivering the highest possible standards of training to their students these organisations ensure that personnel can return to their units with the knowledge and skills to deal effectively with specific threats and to meet the changing needs of contingency operations.

**Modern training simulation systems now play a key role in helping the emergency services improve response times, the safety of their personnel and the public, and their ability to combat a wide and varied range of CRBN incidents.**

Argon Electronics also provides simulation equipment to responders across the globe for local exercises. For example, an exercise based on the radioactive output of a fictitious nuclear power station recently took place in the USA using PlumeSIM software. The capability of PlumeSIM to trigger readings and alarms on the simulation tools carried by response trainees brought a valuable flexibility to the exercise. It allowed the exercise controller to manage the staging of the simulation by pausing or fast forwarding the exercise to suit the precise progress and status of the exercise participants. While a real event would not allow this opportunity, the potential to pause the exercise is valuable in training that may be designed to evaluate, test or validate, and allows the students to get the most out of the day's experience.

The software uses Windows-based software to allow multiple trainees to be managed and monitored from a computer at a central location within the exercise area. Typically, a training exercise scenario is setup using a built-in mapping system or locally drawn plans, onto which a plume or hotspot is defined. This can be based on variety of specific substances, CW agents, radionuclides or compounds, and be configured to reflect different release characteristics including duration, direction, persistence and deposition.

In the classroom, the system allows trainees to navigate a virtual world using gamepad controllers, while simulators indicate readings and alarm accordingly. In the field, trainees are equipped with a portable GPS-equipped device, which automatically receives instructions from the central control computer; the portable device then relays the simulated readings to the simulators carried by the student, which in turn provides an indication of the simulated threat that is present. This system allows the movement of trainees, along with monitoring errors and initiating simulated readings and alarms to be tracked and monitored in real time. All data is recorded and can be analysed after the field exercise, providing individual trainees with detailed feedback on their performance.

An entirely different but equally challenging simulation exercise to the one mentioned above recently took place in the UK. In what was under-

stood to be the first UK event of its kind on such a scale, Argon Electronics provided the Lancashire Fire Service with the capability to safely simulate the release of a radiological hazard. The scenario involved the simulated crash of an aircraft following a terrorist hijack, and the release of a radioactive material at the site.

Firefighters were greeted by the tail section of an aircraft that had crushed a car with passengers inside. Billowing black smoke led on to the main body of the aircraft, realistically manned by 'injured' volunteers who had previously been 'contaminated' with safe simulant materials. Other simulation sources were strategically located in the wreckage. Equipped with Argon simulators in place of the real detectors, personnel were able to realistically carry out their roles without risk of harm or damage to themselves, other participants, their equipment or the environment.

Such is the effectiveness of simulation tools and software that they are now a regular feature of response exercises designed not only as training but as showcases and knowledge-sharing events that aim to promote best practice. For example, one of the aims of RECCEX 12, the major Nordic CBRN Reconnaissance Exercise, which took place in Sweden during August 2012, was to develop and exchange the latest and best methods of responding to CBRN threats. The use of Argon's simulation tools, which were upgraded in preparation for the exercise, enabled the participants to experience first-hand the benefits of today's state-of-the-art equipment. Argon provided over 50 simulators for the exercise. Several chemical reconnaissance exercises were carried out by the platoons, who were tasked with identifying and recording the location of simulated release chemicals, enabling spectators and participants to appreciate first-hand how the operational flexibility of modern simulation equipment enhances the capability to counter CBRN incidents.

Exercises such as these have enabled some specific problems to be identified and addressed long before a real life emergency. These have included problems of reading detection instrument displays accurately in bright sunlight, the difficulty of clearly communicating readings back to a command and control centre while wearing protective clothing, and the confusion that can arise if several personnel are using different detectors, each of which has been calibrated to output readings using different measurement scales.

Modern training simulation systems now play a key role in helping the emergency services improve response times, the safety of their personnel and the public, and their ability to combat a wide and varied range of CRBN incidents. Despite these economically challenging times, it is clear that governments worldwide are placing a high degree of importance on CBRN training. Simulation equipment enables first responder organisations to ensure that personnel are adequately trained to deal effectively with CRBN threats. APF

**Steven Pike** is managing Director of Argon Electronics

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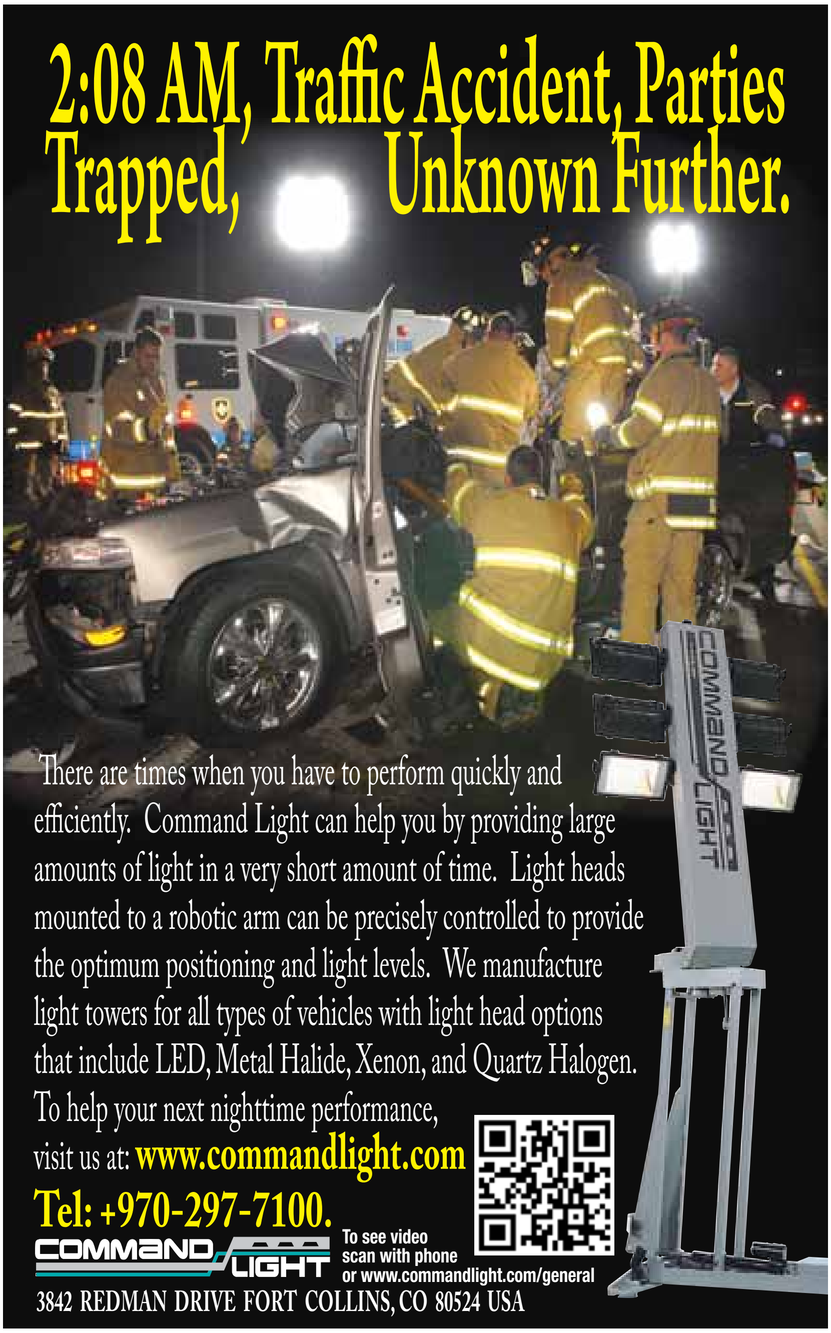

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# Confined Space Re are we?

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**Ian Dunbar**

Holmatro

> "Confined Space" refers to a space, which by design has limited openings for entry and exit, unfavourable natural ventilation that could contain or produce dangerous air contaminants, and that is not intended for continuous employee occupancy.

The dangers of working in confined spaces were written about nearly 2000 years ago during the time of the Roman emperor Trajan (53-117AD.) He sentenced criminals to work in the sewer as punishment and the ill effects were noticed by the physicians of the day. In the middle ages, German scientist and scholar Georgius Agricola noticed that stagnant air in mines caused severe respiratory problems and in 1925 American toxicologist Alice Hamilton wrote that decomposition of organic matter produces hydrogen sulphide, noting this often proved deadly in confined spaces such as vats, tanks and manholes. So bearing in mind we have had two millennia to prepare for confined space rescue, just how ready are we?

Well, research carried out in the USA in the 1980s and 1990s would suggest that maybe we have not come as far as maybe we should have done. A US Department of Health and Human Services study, published in 1994 described 585 separate incidents leading to 670 fatalities (1980-89). Another study looking at confined space deaths from 1983-1993 reports the far more worrying statistic that of the 109 fatalities involved in confined space incidents, 39 (36%) were rescuers themselves.

Thankfully, the last 25 years has seen huge advances in search and rescue equipment and techniques coupled with greatly improved health and safety at work legislation, which has resulted in a reduction in the number of fatal incidents recorded. Despite this downturn, these types of incidents still occur more frequently than we would like, and for that reason we have to be prepared. We need to have mechanisms in place that allow us to react to such incidents and ensure a successful outcome.

# scue: How ready

## Specialist Type of Rescue

Confined space work is still an element of technical rescue that is not widely practiced and does tend to be a specialist role (usually within the spectrum of urban search and rescue techniques) requiring additional skills and equipment. The dilemma facing rescue providers around the world is that because the window of opportunity for rescue is so very small how do you ensure adequate and timely provision of resources?

Of course, if every team that worked in confined spaces was self-sufficient in terms of rescue capability, this would go some way to relieving the burden on local first responders, but this is very rarely the case.

## Hazards

There are two main hazard categories that can be associated with confined space work (and therefore rescue). The overview below details the main elements of the two categories:

**Atmospheric Hazards**

- Oxygen deficiency.
- Oxygen displacement.
- Flammable atmospheres.
- Toxic Gases.
- Solvents.

**Physical Hazards**

- Engulfment in loose material.
- Electrical/Mechanical machinery.
- Falling Objects.
- Temperature Extremes.
- Noise Exposure.
- Wet/Slick surfaces.

## Practical Problems

Civilian work in confined spaces is now heavily regulated due to the hazards listed above. Emergency response into these areas also has to take account of these hazards. In addition to this, rapid access, travel, location treatment and packaging of casualties and swift exit, all have to be done in very difficult and challenging circumstances. All of the elements of rescue we take for granted ‘above ground’ are now compromised. No longer do we have unrestricted movement, a breathable atmosphere, clear communications and a wide selection of equipment, suddenly everything has changed.

## Casualty Considerations

Once the personal safety of the rescue team has been established, the focus then turns to the casualty. As with any other type of rescue, you must obtain as much information as possible regarding the mechanism of injury. This ensures that the team is adequately protected and does not fall foul of the same problems and also allows you to plan your extrication method prior to entry.

If your casualty is conscious, breathing and is able to answer your questions, this is an excellent source of information (and also gives an excellent indication of a patent airway, breathing, circulation and neurological status). However, an unconscious casualty means you have to rely on other information sources. No one working in a confined space should be working alone, and colleagues above ground should be able to provide you with more information.

*Battery pump with next-generation battery technology*

Knowing where the casualty was working, their task, how long trapped/injured and any medical history will allow you to best plan ahead. With this information you can choose the appropriate extrication methods and relevant equipment before committing, saving vital time later in the rescue. Remember, “the golden hour” still applies, so the minimal medical intervention followed by rapid extrication is what will give your casualty the best chance of a favourable outcome. Prior knowledge of the relevant injuries and medical conditions associated with confined space work, will also allow you to assess and extricate your victim in the most appropriate time.

## Training

We need to understand that confined space rescue is a high risk, low occurrence event. It is fair to say that we feel more confident at tackling the low risk (relatively speaking), high occurrence events such as road rescue. Simply put, the more of one type of incident we attend, the more capable we become. We should always identify these types of occurrences and design our training accordingly. Too many rescuers have become victims of confined space incidents and the inability to identify hazards and control the risks have contributed to the vast majority of these deaths.

Approach to confined space rescue will vary across the world. There will be different levels of resources in terms of team members and equipment. Also local, regional and national guidelines

*Hand-operated Power Wedge combines extremely small insertion height with more than 25 tonnes lifting capacity*

will dictate what your standard operating procedures are. The analysis of your local risks should be the starting point for your preparation, as this knowledge will allow you to specifically ensure to have the right equipment to deal with any eventuality you foresee.

The intervals at which you train are also very important. A lot of research has been done into the subject of skills fade. Some studies suggests that more complex tasks, requiring analysis and decision making requires a different approach to simple repetitive practice, and it is important to increase the understanding of the underlying principles involved.

### Equipment

There was once a time when rescuers had a small inventory of tools that had to be used for all manner of applications at operational incidents. The nature of rescuers means that problems are very quickly overcome, and in fact tools were modified to make them more suitable for a wide range of uses.

One result of this inventiveness is that it has largely paved the way for the tools we have available today. Tools that are not only modified, but actually designed and constructed with the sole intention of working in confined spaces, allowing rescuers to overcome some of the practical problems and hazards involved.

### Self-Contained Tools and Battery Technology

Above ground in open, well lit, well ventilated and spacious areas, conventional tools (hydraulic rescue tools with hose and pump) will always be the number-one choice for rescuers throughout the world. The use of single hose technology and couplings that allow tools to be changed under flow has greatly assisted emergency responders in reducing extrication times and making the process safer and easier. For some confined space rescues this equipment may well be your first choice. However, in the vast majority of cases, certainly where deeper penetration is

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required, we have to look for alternatives.

Confined space rescue does not permit limitless resources. Entry of rescuers into the affected area will be limited, for obvious reasons. This limit of personnel also means there is a physical limit to the amount of equipment that can be taken. So the equipment has to be really compact, light, well designed and easy to use. Ironically, the equipment required at these types of incident tends to be bigger and bulkier than its above ground equivalent.

For that reason, the development of self-contained tools means that you now have the possibility to lift, cut and spread in confined spaces using tools that are small, light and compact, with no need for a separate pump and hose. These types of tools can be split into two categories: hand-operated and battery powered.

Hand-operated cutters, spreaders and wedges have and integral two-stage pump that requires relatively little force to operate. The fold-away handles are rotatable through 180 degrees and can be used in any position and adjusted at any time, even during use, when the tool is under pressure. Despite the fact that they are hand controlled, they still operate at 720 bar and have impressive lifting, cutting and spreading forces.

Battery operated tools are excellent for rapid intervention during remote and confined space work. Light (15kg) and compact, they offer the rescuer further options.

Now you also have the option of making your existing tools battery-driven by use of a battery-driven hydraulic pump. This revolutionary technology allows your tools to be used in any environment, and as there are no emissions, they are perfect for confined space work. The batteries in these units have tremendous power and will operate for 90 minutes during normal rescue operations. Offering three-stage technology, they provide higher oil flow, meaning increased tool speed. They are quiet, making casualty identification and subsequent care much easier and safer.

Remember the value of pneumatic equipment at incidents in confined spaces. For example, high pressure airbags capable of lifting five tons weigh as little as two kilogrammes and give a lift/spread of 150mm.

## Conclusion

The risks of working in and rescuing from confined spaces are well known and well documented and for this reason, this type of incident is foreseeable. Despite advances in safety, dedicated tools and improved techniques, the nature of this type of environment means that your skills, equipment and resources will be severely tested and your casualty still requires rescue in a safe timely manner, in line with "the golden hour".

As with any kind of rescue scenario preparation is your strongest weapon if you are to overcome the hazards and risks involved. Training at regular intervals, choosing equipment that is specifically designed for this purpose and having the underpinning knowledge is the only way to manage the risks associated with confined space rescue, and ensure you do not become another statistic. **APF**

**Ian Dunbar** is a Rescue Consultant at Holmatro

For more information, go to www.holmatro.com

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DRIVEN BY: THREE PHASE ELECTRIC MOTOR
CHARGING RATE: 265 L/pm 16 m³/h 9 CFM
POWER: 5,5 Kw (230 /400 V – 50 / 60 Hz)
6,6 Kw (440 /480 V – 60 Hz)
DIMENSIONS: HEIGHT 69 cm / 27",
WIDTH 58 cm,
23", LENGTH 97 cm / 38,5"
DRY WEIGHT: 119 Kg / 262 lbs

MCH 16/DY ERGO
DRIVEN BY: DIESEL YANMAR L 100
CHARGING RATE: 265 L/pm 16 m³/h 9 CFM
POWER: 6,6 Kw
DIMENSIONS: HEIGHT 69 cm / 27",
WIDTH 56 cm / 22", LENGTH 113 cm / 44,5"
DRY WEIGHT: 125 Kg / 275 lbs

MCH-6/SH
DRIVEN BY: HONDA PETROL ENGINE
CHARGING RATE:
100 L/pm 6 m³/h 3,5 CFM
POWER: 3,5 Kw / 5,5 Hp
DIMENSIONS: HEIGHT 35 cm / 13,7"
DEPTH 32 cm / 12,5"
LENGTH 78 cm / 30,7"
DRY WEIGHT: 38,5 Kg / 85 lbs

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# Intelligent Glass D

Mike Wood

For most functions of glass – such as energy and light control – an often too glib familiarity is of little consequence. But where fire is a question, the issues are serious ones and complacency is unjustified. Lives are potentially at stake and there may well be major consequences in horrendous costs for building owners and businesses.

The prime property of glass – its transparency – is a major potential drawback in developed fire conditions. Even if glass stays in place, dangerously high levels of heat can be transmitted by conduction and direct radiation, with additional contributions from re-radiated and convection from a hot glass surface on the non-fire side. That in turn risks secondary fire generation and the production of smoke from smouldering floor coverings, producing a very hot un-breathable, choking atmosphere. In an enclosed environment – such as internal escape ways and lobby areas – transmitted heat can therefore cause unpleasant, untenable conditions, which create unacceptable risks for those trying to get out of the building.

An understanding of glass behaviour in fire is therefore essential for the designer and specifier. Standard glass products are vulnerable to the smallest of fires, and cannot survive intact for any practically safe length of time. In turn, that should lead to an appreciation of the principles of fire-resistant glass and glazed systems so that fire-resistant glass can be used efficiently and effectively within a dominant transparent design concept.

## Designer Choice

Where fire safety in glass construction is concerned the designer is faced by essentially four levels of choice, and accordingly four very different levels of risk.

- The first option is to minimise the use of fire-resistant glass barriers to the minimum, placing reliance implicitly in a faith that fire will not break out and that the fire load can be controlled to minimise the extent of likely fire damage. But good practice modern fire safety relies on integrated fire safety, dependent on interlocking different fire safety systems in an holistic fire safety concept. This choice requires a high degree of confidence that the design and its implicit assumptions are faithfully reproduced as intended through the (usually complex) supply and build chain where cost considerations too often dominate over technical performance considerations, also that the occupation of the building in its lifetime keeps in line with the original design concept – without significant change to use, layout and fire load in a way that conflicts with the basis of the design blueprint.

# esign

- Standard glass products such as tempered – that is, toughened – glass may be used perhaps in combination with sprinklers as substitute fire barriers. This is a high risk option since tempered glass and water do not combine well under fire conditions. There should be no illusions: tempered glass may fail catastrophically and without warning in the face of fire due to thermal stress and shock. Commercially produced tempered glass is not produced consistently enough, with sufficient attention to the critical detail that affects sensitivity to failure. Designers may consider that the use of standard pvb (polyvinylbutyral) safety laminated glass presents a lower risk option – only to replace one critical mode of failure in fire with another. Such laminated interlayers burn vigorously and catastrophically when exposed to heat from a fire, within ten minutes of flame exposure. In the event of fire, chance may substantially determine the outcome. If the flow of water is not complete and continuous over the whole glazed area then there is likely to be a heightened risk of glazing panel and assembly failure.

**An understanding of glass behaviour in fire is therefore essential for the designer and specifier. Standard glass products are vulnerable to the smallest of fires, and cannot survive intact for any practically safe length of time.**

- Integrity fire-resistant glass can be used to hold back the fire for a relatively short period (up to 30 minutes effectively, in developed fire conditions), with a risk that levels of heat on the protected side become too high for people and fixtures, fabrics and fittings. Consideration of transmitted heat levels may cause both the pane size of integrity glass, the extent of glazed area and application to be limited. The level of protection may only be sufficient for the purpose of rapid evacuation of the building in short time (for example, 20 minutes), on the assumption that:
  a) The alarm is given and acted upon relatively promptly.
  b) The occupants are familiar with the building, can move readily and calmly, without support and supervision, in conditions that are not too crowded and congested.
  c) The fire and rescue service receives the emergency call in good time for rapid response, and can get promptly to the fire within a matter of only some minutes.
- The highest level of protection – the lowest risk profile – and the highest degree of confidence in effective fire protection is obtained by the use of a fire-resistant glass that provides reliable insulation performance (together with integrity). Large areas and extensive use of such a fire-resistant glass can be incorporated in the design, in a variety of applications, for the purposes of escape, access and prolonged protection against high fire intensity and hours of exposure. Insulation performance is therefore particularly of value, and used extensively, because of the need for a high level of assurance given the high risk of damage should fire break out and the element of unpredictability that essentially accompanies fire events. Insulation is therefore the most reliable choice and the one that offers maximum peace of mind, especially if the objective is to have a substantial measure of confidence against fire during the working life of the building. It is a level of performance that is essential to guard against the risk of prolonged or intense fires, and the only choice that provides a sufficient safeguard against extensive damage to the building and surrounding buildings from extensive fire development.

### Fire Safety Design with Glass

The role for fire-resistant glass is an essential one to maintain the transparent design concept. Structural resilience in resisting fire and limiting fire spread is a basic prerequisite, and in those respects fire-resistant glass is very effective as part of a fire safety compartmentation and fire separation strategy using the construction and layout of a building to contain and isolate fire.

Fire-resistant glass is also used in partitions or doors to provide protected corridors and transit points for quick and safe evacuation or access by fire and rescue personnel. That includes lobbies around escape stairs, the stairs themselves and refuges as places of relative safety en route to a place of safety outside the building. The sense of openness created by glass constructions also has an advantage: it helps to reduce panic and encourage orderly evacuation by allowing occupants to be aware of what is going on to move away from the seat of the fire.

For the designer working with glass there are three particular areas that merit particular consideration. These are: the combination of fire resistance with sound insulation; the use of integral loaded fire-resistant glass floors to maintain the transparent design core theme; and the use of fire-resistant glass in facades to prevent break out and spread via the facade.

### Combining Fire and Sound Insulation

Plastic organic interlayers are commonly used in glass laminates to help achieve acoustic targets. But these have no significant practical resistance against fire and constitute a danger through ignition and vigorous flaming of the interlayer when exposed to fire (which readily happens since the covering glass pane cracks so easily in fire).

Thermal deterioration of organic layers becomes increasingly rapid from about 150°C onwards, with the generation of heavy smoke and fume before flaming.

Acoustic insulation can readily be combined with certain types of fire-resistant glass, e.g. those that produces fire resistance by the use of an inorganic glassy interlayer (such as Pilkington Pyrodur integrity, with additional benefit of 15 minutes insulation rating, and Pilkington Pyrostop full range of insulation or inorganic gel layers (such as the Contraflam range). It is quite possibly to effectively design with fire-resistant glass types at various levels to achieve very good sound insulation together with reliable fire resistance.

## Loadbearing Fire-Resistant Glass Floors

The transparent glass design concept cannot be said to be complete without the option of fire-resistant glass floor constructions. Fully tested integrally loadbearing solutions are now available using products from major glass manufacturers, and particularly good developments have been made with a 60 minutes rated insulated and integrity structure, using either steel or timber supports.

Such options also combine robust fire protection with effective acoustic insulation. The sound insulation $R_W$ index for the Pilkington Pyrostop glazed floor structure, for example, is 48 (-1;-5), reference EN ISO 717. This is a remarkable result – providing a tremendous combination of fire resistance, acoustic performance, loadbearing capacity, and design capability. The loadbearing capability of the floor must be demonstrated by fire testing under load. The applicable test standard in Europe is EN 1365:2000, part 2, Fire resistance tests for loadbearing elements: floors and roofs, subject to loads determined in accordance with EN 1363-1. An applicable successful test report is essential for all fire-resistant glass systems.

The make-up of the floor system has to guard against the possibility of heat transfer into the structure of the floor itself, and the glass used must be a fully established and validated insulation with integrity glass to restrict the possibility of heat transfer into the glass floor structure itself. Un-insulated integrity fire-resistant glass, on the other hand, risks structural instability under load and fire exposure because of the possibility of heat transfer into the structure.

## Façade Glazing

One of the major risks concerning fire spread is the threat of fire break out from inside the building through the glazed façade either to transfer fire to facing buildings or to allow ready fire transfer up the face of the same building jumping from floor to floor (clearly a concern for tall and especially complex multi-occupancy type buildings).

Such a threat can easily be countered by incorporating sections of fire-resistant glazed systems in the façade. In most situations a high performance integrity glass in a double glazed unit would suit, in others the risks and value of the building and surrounding buildings may also justify the use of a higher performance level of fire protection, using insulation performance (for example for sections of atria adjoining lobby, escape and refuge areas).Similar considerations should also apply for atria where there is a risk of break out into the atria from the adjoing room spaces.

Such a design strategy does not need the whole façade to be constructed from fire resistant glazing. Bands of fire-resistant construction at regular intervals running up the building would be sensible, to act as a fire break according to a well tried and tested principle. Such installations should also be considered at particular hazard locations or critical safety points. Such locations, for example, would be external glazing at re-entrant corners and angles in the façade to prevent fire jumping across the gap on the same floor level, bypassing internal compartmentation. Similar considerations apply to protection for escape lobbies, vertical stairways and for glazing adjoining roofs and external escape ways.

## Looking to the Future

The design job certainly does not get any easier. The trend in the built environment is towards the more complex, crowded, taller and individualistic, at the lowest possible overall cost and optimum efficiency, whilst seeking to create sustainable building value and optimum function. There is increasing pressure on space utilisation as owners look to squeeze the maximum use from their buildings. All those trends increase the threat of fire. And since glass has a major role to play in modern design, there will always be a vital and expanding role for fire-resistant glazed systems.

The stakes are high. And the overall message concerning glass and fire is a basic one: Do not take unwarranted risks, based on unjustified assumptions. **APF**

**Mike Wood** is a technical consultant on glass and fire. He is chair of the UK's Passive Fire Protection Federation (PFPF) and a member of the Fire Sector Federation Executive

For further information, go to www.pilkington.co.uk/fire

# Mapping Fire in the Top End

**Nathan Maddock**

Bushfire CRC

A Bushfire CRC researcher is changing the way the effects of bushfires are mapped in northern Australia.

Bushfires in the southern parts of the Australia may have occupied most of the attention in recent years, particularly in the media, but a Bushfire CRC researcher has been using satellites and high technology sensors to map the effects of fire in the delicate ecosystems in northern Australia.

For the past few years Darwin-based researcher, Andrew Edwards, has been mapping bushfire severity in the tropical north with the assistance of satellites and a helicopter, as part of the Bushfire CRC program *Understanding Risk*. Dr Edwards completed his PhD with the Bushfire CRC in 2011, and has now begun a Bushfire CRC-funded Post Doctorate to extend and operationalise his previous research.

While northern Australia has approximately one person for every four square kilometres, the tropical savannahs found across northern Queensland, Western Australia and the Northern Territory – woodland ecosystems of grass and scattered trees – cover approximately 25 percent of the country. It receives large amounts of rain, with 90 percent of its 1000mm average rainfall occurring during the wet season, from October to March. A large amount of fuel grows during the wet season, drying rapidly once the rain stops, resulting in prime fire conditions.

Dr Edwards' PhD research sought to find out if it was possible to detect the effects of fire in tropical savannah areas by using a hand-held sensor in a helicopter to measure the reflected light of various fire severities. The data collected was correlated with ground measurements to determine which of the fire-affected components was affecting the light signal to describe the fire severity.

Dr Edwards covered a lot of territory. He comments: "Most of the data was collected from the helicopter. I had a hand-held sensor as the helicopter hovered, establishing the exact GPS coordinates of the area studied. I was looking at the effects fire has on the environment – how severely the vegetation is burnt and relating that to the energy released by the fire."

He continues: "Measurements of the effects of a fire were also taken from the ground to validate the data collected from the air. Both sets of data were correlated, and an algorithm established that maps fire severity from satellite images covering hundreds of square kilometres."

The data is useful for a number of purposes, adds Dr Edwards. "It helps conservation management planning, greenhouse gas emissions accounting and assists in determining the efficacy of fire breaks. With fire severity we have got this added parameter that provides a lot more detail across all of these areas, assisting in calculations and modelling exercises."

Under the extreme climate of Australia's north, prescribed burning is applied widely and strategically to reduce the effect of bushfires. Prior to Dr Edwards' research, fire and land managers had relied on satellite data to both detect bushfires and to map their extent. Strategic fire management programs were based on the history of past fires, using fire seasonality to estimate the affect a bushfire might have had on the environment. The rule of thumb was that bushfires occurring later in the dry season were more severe than bushfires that occurred earlier in the dry season.

*Dr Andrew Edwards boards the helicopter holding a spectromter, a device used to measure the reflected light of various fire severities*

Now, thanks to Dr Edwards' research, a reliable means of mapping fire severity will provide much-needed information about the effectiveness of prescribed burns, the quantity of fuel consumed that creates greenhouse gas emissions and a direct correlation between the effects of fire on habitats for a variety of animals.

Australia's tropical savannahs are the largest single source of greenhouse gas emissions in Australia, emitting two percent of the country's greenhouse gases in 2005. Reducing both the severity and the area burnt by bushfires reduces these greenhouse gas emissions.

From here, Dr Edwards is expanding his PhD research in his Post Doctorate studies. "The next step is calibrating the data and applying it, and then looking to extend it to cover the rangelands. Together with the tropical savannah, this has the potential to cover 75 percent of the country," he points out.

Calibration is a way of training the satellite image information with the on the ground information to categorise something on the ground. This is required to capture as much variation in the effect of a fire as possible. Dr Edwards adds that the success of such a large project will involve many end users of the research, including field ecologists, conservation staff, fire management staff, pastoralists, indigenous rangers and other land managers. His project has been supported by the Bushfire CRC, Bushfires NT, the North Australia Indigenous Land and Sea Management Alliance, CSIRO, Western Australia's Department of Environment and Conservation and Charles Darwin University.

It is hoped that the provision of timely cost effective mapping will save time and resources for all of these organisations, and has the potential to enable fire managers to reduce the area affected by fire. And in one of the most fire prone areas of the world, that can only be a good thing.

More detailed information about Dr Edwards' research can be found by visiting the project page on the Bushfire CRC website. A short video of Dr Edwards' discussing the research can also be viewed. APF

**Nathan Maddock** is Communications Officer at Bushfire CRC

For further information, go to www.bushfirecrc.com

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99/6 Rosmead Place
Colombo 7
Tel: +94 112 699 699
Fax: +94 112 695 047
Email: cbe@cbe.lk
Website: www.cbe.lk
**Dealer/Distributor**

### TAIWAN

**SENSOR LTD**
No. 8-1, Rueiguang Road, Neihu Chiu
Taipai, Taiwan 114
Contact: Alex Jeng
Tel: (00 886) 2 8792 9881
Fax: (00 886) 2 8792 9885
Email: sensor.fire@msa.hinet.net
Website: www.sensorfire.com
**Dealer/Distributor**

### THAILAND

**MASSTEC FIRE ENGINEERING CO LTD**
63 Sol Chokechai 4, Sol 84 Ladprao Rd,
Ladprao, Bangkok 10230, Thailand
Tel: +662 942-1431-5 Ext 151
Fax: +662 942-3886
Email: norpong@masstecfire.com
**Dealer/Distributor**

## ANSELL PROTECTIVE SOLUTIONS

### AUSTRALIA

**SAFETY EQUIPMENT AUSTRALIA PTY LTD**
Private Bag 1001, Mona Vale, NSW 2103, Australia
Tel: +61 2 9910 7500
Fax: +61 2 9979 5463
Email: sea.australia@sea.com.au
Website: http://www.sea.com.au
**Dealer/Distributor**

### CHINA

**ANSELL (SHANGHAI) COMMERCIAL AND TRADING CO LTD**
Room 903-905, Tower 1, Hongwell Plaza
No. 1600 Zhongshan Rd. (W)
200235 Shanghai, China
Tel: +86 21 5103 6377
Fax: +86 21 5407 1107
Email: orderprotective@eu.ansell.com
Website: http://protective.ansell.com
**Representative Office**

### INDIA

**FRANCIS LESLIE & CO PVT LTD**
Eucharistic Congress Bldg 1, 5 Convent Street
Colaba, 400 001 Mumbai, India
Tel: +91 22 22 027 741
Fax: +91 22 25 542 926
Email: fleslie@vsnl.com
**Dealer/Distributor**

### JAPAN

**GADELIUS INDUSTRY K.K.**
5-2-39 Entsuji Gadelius Blgd.
Akasaka
Minato-ku
107-8302 Tokyo
Japan
Tel: +81 3 3224 3415
Fax: +81 3 3224 3435
Email: information@gadelius.com
Website: http://www.gadelius.com
**Dealer/Distributor**

### NEW ZEALAND

**ARGUS-REALCOLD LTD**
PO Box 12-519 Penrose
Auckland
New Zealand
Tel: +64 9 526 5757
Fax: +64 9 526 5755
Email: info@argus.co.nz
Website: http://www.argus.co.nz
**Dealer/Distributor**

### SINGAPORE

**ANSELL PROTECTIVE SOLUTIONS SINGAPORE PTE LTD**
4, Jalan Pesawat, 619362 Singapore
Tel: +65 6262 1664
Fax: +65 6265 9853
Email: orderprotective@eu.ansell.com
Website: http://protective.ansell.com
**Representative Office**

### SOUTH KOREA

**SCADA ENGINEERING CO LTD**
714-5 Daerim 3-dong
Youngdeungpo-Koo
150-814 Seoul
South Korea
Tel: +82 2 842 5525
Fax: +82 2 842 5524
Email: scadamsyoon@korea.com
**Dealer/Distributor**

### SRI LANKA

**HALCHEM LANKA PVT LTD**
No. 07, Siri Dhamma Mawatha, Colombo 10
Colombo, Sri Lanka
Tel: +94 11 5843213/5843219
Fax: +94 11 2674 615
Email: sales@halchem-lanka.com
Website: http://www.halchem-lanka.com
**Dealer/Distributor**

### TAIWAN

**VAN PROTECTEUR CO LTD**
No.115, Zhongcheng Road, Tucheng
23674 New Taipei City, Taiwan ROC
Tel: +886 2-2268-6622
Fax: +886 2-2268-1239
Email: vanprote@ms34.hinet.net
Website: http://www.vanprote.com
**Dealer/Distributor**

## BAUER COMPRESSORS

### AUSTRALIA

**BAUER KOMPRESSOREN AUSTRALIA PTY LTD**
2/35 Hallstrom Place
Wetherill Park
Sydney, NSW 2164 Australia
Tel: +61 (0)2 9756 2700
Fax: +61 (0)2 9756 1700
Email: enquiries@bauer-kompressoren.com.au
**Bauer Subsidiary Office**

**BANGLADESH**

### BIZ2SAFE ENTERPRISE PTE LTD
192/1 East Kafrul, Dhaka Cantonment
Dhaka 1206, Bangladesh
Contact: Mr Gupta
Tel: 88 0 2 875 0010 or 9198 202 98969
Fax: 88 0 2 871 4400
Email: biz2save@gmail.com
**Dealer/Distributor**

**BRUNEI**

### BAUER COMPRESSORS ASIA PTE LTD
2 Penjuru Place
#01-05 Penjuru Tech Hub
Singapore 608783
Contact: Mr Stephen Kellett
Tel: +65 6271 6271
Fax: +65 6272 3345
Email: info@bauer-compressors.com.sg
**Bauer Subsidiary Office**

**CAMBODIA**

### SCUBA NATION DIVING CENTRE
18 Eo Sothearos Blvd (FCC area)
Phnom Penh
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Tel: +885 0 127 15785
Fax: +885 0 232 11850
Email: info@divecambodia.com
**Dealer/Distributor**

**CHINA**

### BAUER KOMPRESSOREN SHANGHAI LTD
878 Jianchuan Road, Minhang
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**Bauer Subsidiary Office**

**FRENCH POLYNESIA**

### TAHITI SPORT
PO Box 62, 98713 Papeete, Tahiti
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Email: plongee@tahiti-sport.pf
**Dealer/Distributor**

**HONG KONG**

### BAUER KOMPRESSOREN CHINA LTD
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139-141 Hoi Bun Road
Kwun Tong, Kowloon
Hong Kong
Tel: 852-2595 1898
Fax: 852-2595 0878
Email: bkc@bauerchina.com
**Bauer Subsidiary Office**

**INDIA**

### BAUER KOMPRESSOREN INDIA PVT LTD
A 71/72, H Block, MIDC Pimpri
Pune – 411 018, India
Tel: +91 20 67308100 to 7
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**Bauer Subsidiary Office**

**INDONESIA**

### DIVEMASTERS INDONESIA
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No. 39A Pela Mampang
Jakarta 12720
Indonesia
Tel: 62-21 719 9045
Fax: 62-21 719 8974
Email: sales@divemasters.co.id
Website: www.divemasters.co.id
**Dealer/Distributor**

**KOREA**

### TECKO CO LTD
2F, SK@Technopark
Mega-Dong
190-1 Sangdaewon-Dong
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Tel: +82 31 776 2442
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Email: kylee@tecko.co.kr
**Dealer/Distributor**

**MALAYSIA**

### SK CRYOGENICS SDN BHD
No. 16 Jalan Anngerik Mokara 31/52
Section 31, Kota Kemuning
40460 Shah Alam, Selangor, Malaysia
Contact: Mr Steve Kellett
Tel: +60 3 5122 4269
Fax: +60 3 5122 4235
Email: steve@skcryogenics.com
**Dealer/Distributor**

**PAKISTAN**

### ALPINE INDUSTRIALCON PVT LTD
305/2 G.T. Road
Baghbanpura
Lahore, Pakistan
Contact: Mr Kashif Ahmad
Tel: +92 42 685 2313
Fax: +92 42 655 3674
Email: alpinelahore@hotmail.com
**Dealer/Distributor**

**PHILIPPINES**

### PACIFICA DIVE CENTER
2226 Chino Roces Avenue
Makati City, Philippines
Contact: Mr Torben Bohn
Tel: +632 8464 220
Fax: +632 5536 621
Email: torben@pacificadive.net
**Dealer/Distributor**

**SINGAPORE**

### BAUER COMPRESSORS ASIA PTE LTD
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#01-05 Penjuru Tech Hub
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Tel: +65 6271 6271
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### MARINE & INDUSTRIAL COMPRESSORS
194 Pandan Loop
#05-25 Pantech Business Hub
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Tel: 62540813/62506018/68737337/68733835
Fax: 62538443
Email: masmarin@singnet.com.sg
**Dealer/Distributor**

**SRI LANKA**

### HALCHEM LANKA PVT LTD
No 7, Siri Dhamma Mawatha
Colombo 10, Sri Lanka
Contact: Mr Cyril Halloluwa Managing Director
Tel: +94 11 5843213 and 5843219 (Direct)
Fax: +94 11 2674 615 and 2792 406
Email: cyril.halloluwa@halchem-lanka.com
Website: www.halchem-lanka.com
**Dealer/Distributor**

**TAIWAN**

### MING SHEN ENTERPRISE CO LTD
5, PaShih 1 Street
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Fax: +886 (2) 2809 6189
Email: tom@3arrow.com.tw
**Dealer/Distributor**

**THAILAND**

### BANGKOK ENGINEERING AND TECHNOLOGY CO LTD
31/59-60 Moo 6 Pracharaj Road
T. Taladkhwan
A. Muangnonthabury Nonthabury
Thailand 11000
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Fax: +662 9685 379
Email: win@betco.co.th
**Dealer/Distributor**

### DIVE SUPPLY CO LTD
88/5 Patak Rd
Chalong Bay
Phuket 83130
Thailand
Tel: +66 (76) 383414
Fax: +66 (76) 281525
Email: gm@divesupply.com
**Dealer/Distributor**

### INTERSOL ENGINEERING & TECHNOLOGY PTE LTD
7/288 Moo 6, Chaengwattana Road
Bhanmai, Pakkred, Nonthaburi 11120, Thailand
Contact: Mr Nathanan
Tel: +66 2 9808754
Fax: +66 2 9808753
Email: nathanan@intersol.th.com
**Dealer/Distributor**

**VIETNAM**

### FRANCO-PACIFIC VIETNAM CO LTD
55 Ho Hao Hon Street, District 1
Ho Chi Minh City, Vietnam
Contact: Mr Colm Minogue
Tel: +84 8 836 0257
Fax: +84 8 836 1387
Email: colmminogue@francopacific.com
**Dealer/Distributor**

## BRISTOL UNIFORMS

**AUSTRALIA**

### PAC FIRE AUSTRALIA (formerly Pacific Helmets Australia)
1/28 Burnside Road, Hallmarc Business Park
Yatala Qld 4207, Australia
Tel: +61 7 3441 7100
Fax: +61 7 3441 7177
Email: sales@pacfire.com.au
Website: www.pacfire.com.au
**Dealer/Distributor**

**BANGLADESH**

### MANIK BROTHERS
Hai Mansion (3rd Floor), 9/3 Motijheel Circular Road
Dhaka – 1000, Bangladesh
Contact: Mr A K Bhowmick
Tel: +880 2 7100 589
Fax: +880 2 7100 386
Email: manikbrs@dhaka.net
**Dealer/Distributor**

**BRUNEI**

### YEN LEE FIREWELD PTE LTD
18 Penhas Road, 208182, Singapore
Tel: +65 62909890
Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
**Dealer/Distributor**

**FIJI**

### PHILLIPS & SMITH LTD
10 Akatea Road, Glendene
Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

**HONG KONG**

### CHUBB HONG KONG LTD
10/F Octa Tower, 8 Lam Chak Street
Kowloon Bay, Kowloon, Hong Kong
Contact: Simon Tsang
Tel: +852 2746 9736
Fax: +852 2627 6768
Email: simon.tsang@chubb.com.hk
Website: www.chubb.com.hk
**Dealer/Distributor**

**INDIA**

### FOREMOST MARKETING PVT LTD
M-1 Green Park Extn
New Delhi 110016 India
Contact: Mr Vinay Khanna
Tel: +91 11 261 969 82
Fax: +91 11 261 669 61
Email: foremosttechnico@gmail.com
Website: www.foremostsafety.com
**Dealer/Distributor**

**INDONESIA**

### PT INSPIRAN IDEAL INDOTAMA
Jl. Pejaten Barat No. 39, Pasar Minggu
Jakarta Selatan 12510, Indonesia
Contact: Lim Tiam Hwat
Tel: 62-21-7182472 Mobile: 62-816889164
Fax: 62-21-7182578
Email: lim@inspiran.co.id
Website: www.inspiran.co.id
**Dealer/Distributor**

### JAPAN

#### ABLE-YAMAUCHI CO LTD
Yokohama Nishiguchi, SIA Building
10-36 Kitasaiwai, 2-Chome Nishi-Ku
Yokohama 220-0004, Japan
Contact: S Yamauchi
Tel: +81 45 312 1130
Fax: +81 45 312 1350
Email: emiko@able-yamauchi.co.jp
Website: www.able.yamauchi.co.jp
**Dealer/Distributor**

### MALAYSIA

#### DASAPREM (M) SDN BHD
10 & 12 Jalan Muara 8/9
40000 Shah Alam
Selangor Darul Ehsan, Malaysia
Contact: Mr Prem R Murthy
Tel: +603 550 9060
Fax: +603 550 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com
**Dealer/Distributor**

### NEW ZEALAND

#### PHILLIPS & SMITH LTD
10 Akatea Road, Glendene
Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

### PHILIPPINES

#### 24 HR RESOURCES CORPORATION
602 A San Joaquin St
Cor Sto Nino St Brgy
Plainview Mandaluyong City
1550 Metro Manila, Philippines
Contact: Raffy Alpajaro – Account Manager
Tel: +632 5311258
Email: sales.24hrirc@gmail.com

### SINGAPORE

#### YEN LEE FIREWELD PTE LTD
18 Penhas Road, 208182, Singapore
Tel: +65 62909890
Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
Website: www.fireweld.com.sg
**Dealer/Distributor**

### SRI LANKA

#### FIRETECH (PRIVATE) LTD
34 Walter Gunesekara Mawatha
Nawala, Sri Lanka
Contact: Leon Daniels
Tel: +94 11 4410588
Fax: +94 11 2806666
Email: firetech@pan.lk
**Dealer/Distributor**

### TAIWAN

#### SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD
No 222-2 Sec2, Cheng Tai Rd
Wu-Ku Shiang, Taipei, Hsien, Taiwan
Contact: Liu Yuan Hung
Tel: +886 22292 1751
Fax: +886 22291 1984
Email: sheng.tai@msa.hinet.net
Website: www.shengtai.com.tw
**Dealer/Distributor**

### VIETNAM

#### TRAN VU TRADING CO LTD
61 Ban Co Street, District 3,
Hochiminh City, Viet Nam
Contact: Tran Vu Hong
Tel: +84 88325101
Fax: +84 88309586
Email: sales@tranvufire.com
Website: www.tranvufire.com
**Dealer/Distributor**

## COLTRI ASIA PACIFIC

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#### UNDERWATER SALES PT LTD
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Tel: 0400 348 377
Fax: 612 95024657
**Dealer/Distributor**

### CHINA

#### SHANGHAI PANNY TRADING CO LTD
142 Lane 82 Jialin Rd, Pudong new area
Shanghai Code: 201206
Contact: Mr. Todd
Tel: +86-21-50314490 Fax: +86-21-50314491
Email: panny-ye@hotmail.com
Website: www.coltrisub-china.com
**Dealer/Distributor**

### HONG KONG AND MACAU

#### WAH SHING COMPANY
NO. 2B -2C, G/F., Larch Street
Tai Kok Tsui, Kowloon, Hong Kong SAR
Contact: Miss Jackio Kwok
Tel: +852 2391 3997, +852 2391 4084
Fax: +852 2789 4638
Email: wahshingcompany@gmail.com
**Exclusive Distributor**

### INDIA, BHUTAN, NEPAL AND BANGLADESH

#### JYOTECH ENGG & MKTG CONSULTANTS
**Corp. HQ:** B-127, Sector 65, NOIDA – 201301
Distt Gautam Budh Nagar, U.P
Tel: Direct: 0120-4711304, 0120-4711300
Mobile: 09811115979 Fax: 0120-4711317
Email: sales@jyotech.com
Website: www.jyotech.com
**Subsidiaries**
Email: jyotech bangladesh@jyotech.com
Email: jyotech nepal@jyotech.com
Email: jyotech bhutan@jyotech.com
**Exclusive Distributor**

### INDONESIA

#### DIVEMASTERS INDONESIA, BALI
Jl. By Pass I Gusti Ngurah Rai No. 314 Sanur
Denpasar 80228 Bali, Indonesia
Tel: +62361 283138 Fax: +62361 285736
Email: sales@divemasters.co.id
**Dealer/Distributor**

#### DIVEMASTERS INDONESIA, JAKARTA
Jl.Bangka Raya No.39A, Jakarta 12720, Indonesia
Tel: +6221 7199045 Fax: +6221 7198974
Email: sales@divemasters.co.id
**Dealer/Distributor**

#### LAUTAN MAS
Jl. Toko Tiga No. 24, Jakarta 11230, Indonesia
Tel: +62 (0) 21 690-1333 Fax: +62 (0) 21 690 2479
Email: info@LautanMas.Com
Website: www.lautanmas.com
**Dealer/Distributor**

### KOREA, REPUBLIC OF

#### DONGJIN ENGINEERING CO LTD
Gwansan-Dong 570, Deokyang-Gu
Goyang-City, Gyunggi-Do, Korea
Tel: 82-31-969-7286/7 Fax: 82-31-969-7284
Email: Mr Inchul Yoo/ President (dj7286@naver.com),
Mr Sky Shin/ Director (asglobal@naver.com)
Website: www.dongjineng.or.kr
**Dealer/Distributor**

### MALAYSIA

#### RAINBOW RUNNER S/B
383D Jln Ampang 50450
Kuala Lumpur, Malaysia
Branch: 3.06, Plaza Berjaya Jln Imbi
55100 Kuala Lumpur Malaysia
Tel: +60 (03) 42514368 or 42515368
Branch: +60 (03) 21414587
Fax: +60 (03) 42511268
Branch: +60 (03) 21487440
Website: www.rainbowrunner.net
**Dealer/Distributor**

### MALDIVES

#### COLTRI COMPRESSORS MALDIVES
Tel: +9607924199 Fax: +9603321837
Email: coltricompressor@coltrisubmaldives.com
Website: www.coltrisubmaldives.com
**Dealer/Distributor**

### NEW ZEALAND

#### AIR TECHNOLOGY LIMITED
PO Box 305065, Triton Plaza
Auckland 0757
New Zealand
Contact: Ross Irvine, Managing Director
Tel: 64-9-478 9995 Fax: 64-9-478 6221
Email: sales@airtec.co.nz
Website: www.divecompressors.co.nz
**Exclusive Distributor**

### PHILIPPINES

#### DIVE SUPPLY SUBIC INC
Office 4 & 7 EMS Building, 14th St., Subic Gate
Perimeter Road, Subic Freeport Zone
2222 Olongapo, Philippines
**Dealer/Distributor**

### POINT OF SALE LOCATIONS

#### AQUAVENTURE WHITETIP DIVE SUPPLY – BORACAY
Stall 109 D' Mall D' Boracay Phase 4 Station 2
Brgy. Balabag, Malay Aklan, Boracay
Tel: (6336) 288-5615
Email: boracay@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

#### AQUAVENTURE WHITETIP DIVE SUPPLY – CEBU
Unit 14 Borromeo Arcade Bldg.
39 F Ramos Street, Cebu
Tel: (6332) 412-5561
Email: cebu@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

#### AQUAVENTURE WHITETIP DIVE SUPPLY – MACTAN
Bagumbayan 2, Maribago
Mactan Island
Lapu Lapu
Tel: (6332) 492-0122
Email: mactan@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

#### AQUAVENTURE WHITETIP DIVE SUPPLY – MAKATI
Unit 101-102 Metropolitan Terraces Condominium
Sacred Heart cor. Kamagong Streets
San Antonio Village, Makati
Tel: (+632); 519-8375, 519-8376; 846-8344
Email: makati@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

#### AQUAVENTURE WHITETIP DIVE SUPPLY – MANILA
1362 A. Mabini Street
Unit 101-106 Joncor II Bldg.
Ermita, Manila
Tel: (632) 521-0433
Email: ermita@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

#### AQUAVENTURE WHITETIP DIVE SUPPLY – PUERTO GALERA
Sabang Beach, Oriental Mindoro
Puerto Galera
Tel: (6343) 287-3172
Email: puertogalera@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### SINGAPORE

#### ALLROUND ADVANCED TECHNOLOGIES PTE LTD
105 Sims Ave
#03-06 Chancerlodge Complex
Singapore 387429, Singapore
Tel: +65 6749 2778 Fax: +65 6749 2977
Email: enquiry@allround.com.sg
**Exclusive Distributor**

### SRI LANKA

#### V. M. PRO DIVE LANKA ( PVT) LTD
No: 30/90 S, Longdon Place
(Malala Sekara Mawatha)
Colombo – 7, Sri Lanka
Tel: ++9431-5679596
Fax: ++94312275010
Email: vmgroupintl@gmail.com
**Dealer/Distributor**

### TAIWAN

#### NELVIN CO LTD
14F-6, No. 76, Sec. 1, Fu-Shings Rd
Taipei, Taiwan
Tel: (886) 2-2721-9770
Fax: (886) 2-8773-2047
Email: nelven@ms18.hinet.net
Website: www.nelven.com.tw
**Dealer/Distributor**

**THAILAND, VIETNAM, CAMBODIA**

### SIAM DIVING ENTERPRISES ASIA PACIFIC CO LTD

50/10 Moo 2, Chaloemprakiat Ratchakan
Thi 9 Road, Soi 48, Dokmai, Prawet
Bangkok, 10250, Thailand
Tel: +66 2 726-6101-5 Fax: +66 2 726-6106
Email: sdesystems@csloxinfo.com
Website: www.scuba-diving-equipment.com
**Exclusive Distributor**

**VIETNAM**

### COLTRI COMPRESSORS VIETNAM

120/54a Nguyen Thien Thuat Street
Nha Trang, Vietnam
Tel: +84 (0) 914 029 790 Fax: +84 (0) 58 252 0576
Email: craig@coltrisubvietnam.com
Website: www.coltrisubvietnam.com
**Dealer/Distributor**

Cutters Edge
FIRE RESCUE SAWS

**CHINA**

### ANCOM SYSTEMS INC

Building 5, Courtyard 10 Village
Middle Road, North 3rd Ring Road
Beijing, PR 100011
Contact: Pei Zhang
Tel: 86 10 6202 2792
Fax: 86 10 6207 7929
Email: hung.fang@utoronto.ca
Website: www.ancom.cn
**Dealer/Distributor**

### NORLAN ENTERPRISES, INC

Room 952, #218 Tang Li Road
Chao Yang District, Beijing, PR 100012
Tel: 86 10 84673721
Fax: 86 10 84673770
Email: helenwang@norlan.cn
Website: www.norlan.cn
**Dealer/Distributor**

### WUXI NEW FIRETRE SAFETECH LTD

Block 3, Long Shan Wen Bo Industrial Park
Qian Yao Road, Hu Bin District
Wuxi, Jiangsu Provence, PR 214151
Tel: 86 510 8225 5991
Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com
**Dealer/Distributor**

**HONG KONG**

### TIAN YOU INTERNATIONAL DEV CO

Room 119, International Trade Centre
11-19 Sha Tsuo Road, Tsuen Wan, Hong Kong
Contact: Philip Shek
Tel: 852 24161241
Fax: 852 24169636
Email: info@tianyou.com.hk
**Dealer/Distributor**

**INDIA**

### ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar,
Sushil Muni Square, Shankar Road
New Delhi PIN – 110 060, India
Tel: 91 11 49458800
Fax: 91 11 49458844
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**INDONESIA**

### PT MITRA TEKNIKATAMA SUPPLINDO

Jl Ekor Kuning No 1, Pasar Ikan
Penjaringan, Jakarta Utara 14440
Contact: Adelaide Sagitaria
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Email: Adelaide@mitrateknikatama.com
**Dealer/Distributor**

**JAPAN**

### TEIKOKU SEN-I CO LTD

5-13, 2 Chome, Nihonbashi, Chuo-Ku, Tokyo 103
Contact: Mr Satoh
Tel: 81 332813026 Fax: 81 332813090
Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
**Dealer/Distributor**

**MALAYASIA**

### CITO MARKETING, SDN BHD

No 11, Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
Selangor, Darul Ehsan 47301
Contact: Abu Raihan Jaafar
Tel: 60 37311286
Fax: 60 37340583
Email: cito@po.jaring.my
**Dealer/Distributor**

### SJA TRADE & SERVICES, SDN BHD

Kelana Center, Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor, Darul Ehsan 47301
Contact: Hetty Zurin Hamdan
Tel: 60 37847400
Fax: 60 37848500
**Dealer/Distributor**

**PHILLIPINES**

### SMARTGUARD

16 Blk 47th Street Extension
Capitol Subdivision
Bacolod City
Negros Occidebtal 6100
Contact: Alberto Benedicto or Aldwin K Chua
Email: Smartguardphilippines@Yahoo.Com
**Dealer/Distributor**

**SOUTH KOREA**

### JINUTEC INTERNATIONAL DIVISION

711 Visiontop Officetel 374-4
Won-DongOsan City
Korea
Contact: Na Hae-Yul
Tel: 82 31 3758558
Fax: 82 31 3754884
Email: hyna@jinutec.com
Website: www.jinutec.com
**Dealer/Distributor**

**TAIWAN**

### ALL STRONG TRADING CO LTD

No 110 Sec. 2
Chang An E Road
7th Fl. King Isian Bldg
PO Box 46-482
Taipei
Contact: K C Huang
Tel: 886 2250 79976
Fax: 886 2250 75253
Email: allstron@ms19.hinet.net
**Dealer/Distributor**

### PACIFIC CENTURY INDUSTRIAL CO LTD

PO Box 55-719
6F-7 No, 21, Sec 3
Min-chung East Rd
Taipei
Contact: Ming Ko
Tel: 886 2251 77217
Fax: 886 2282 78101
Email: mingko@ms16.hinet.net
**Dealer/Distributor**

Dräger

**AUSTRALIA**

### DRÄGER SAFETY PACIFIC PTY LTD

Axxess Corporate Park Unit 99/45
Gilby Road
Mt. Waverley
VIC 3149
Tel: +61 3 9265 5000
Fax: +61 3 9265 5095
Email: customer.service@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**CHINA**

### DRÄGER SAFETY EQUIPMENT (CHINA) CO LTD

A22, Yun An Road
B Area
Tianzhu Airport Industrial Zone
Beijing 101300
Tel: +86 10 8049 8000 Ext. 213
Fax: +86 10 8049 8005
Email: sales.safety.cn@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**INDONESIA**

### PT DRÄGERINDO JAYA

Beverly Antasari Building
Jl. Pangeran Antasari No.67
Unit L
Cilandak Barat
Jakarta Selatan 12430
Tel: +62 21 7513 289 or +62 81 1907 678
Fax: +62 21 7512 052
Email: Product.supportindonesia@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**JAPAN**

### DRÄGER SAFETY JAPAN LTD

3-8-1 Toyo
Koto-Ku
Tokyo 135-0016
Tel: +81 3 4461 5111
Fax: +81 3 4461 5100
Email: sales.safety.jp@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**KOREA (SOUTH)**

### DRÄGER SAFETY ASIA (KOREA REP. OFFICE)

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208-13 seongsu 2-ga 3-dong
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Tel: +82 2 64 15 8222
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Email: Sales.korea@draeger.com
Website: www.draeger.com
**Representative Office**

**MALAYSIA**

### DRÄGER SAFETY ASIA PTE LTD (MALAYSIA)

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11/18 Bandar Sunway
46150 Petaling Jaya, Selangor
Tel: +60 3 5635 6460
Fax: +60 3 5635 4171
Email: dsa.malaysia@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**SINGAPORE**

### DRÄGER SAFETY ASIA PTE LTD

67 Ayer Rajah Crescent
#06-03, 139950 Singapore
Tel: +65 6872 9288
Fax: +65 6512 1908
Email: dsa.singapore@draeger.com
Website: www.draeger.com
**Regional Office**

**TAIWAN**

### DRÄGER SAFETY TAIWAN CO LTD

12F, Kuohua Building, 868-5
Chung Cheng Road
Chung Ho City 235
Tel: +886 2 2223 6388
Fax: +886 2 2223 2258
Email: sales.taiwan@draeger.com
Website: www.draeger.com
**Dealer/Distributor**

**THAILAND**

### DRÄGER SAFETY (THAILAND) LTD

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Website: www.draeger.com
**Dealer/Distributor**

**VIETNAM**

### DRÄGER SAFETY ASIA PTE LTD

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Website: www.draeger.com
**Representative Office**

## DR STHAMER HAMBURG

**SINGAPORE**

### TETRA FIRE ENGINEERING PTE LTD

10 Ubi Crescent #05-04, Ubi Techpark
Singapore 408564
Contact: Mr T S Lee
Tel: (65) 6841 4429
Fax: (65) 6841 5267
Email: tetra@singnet.com.sg
**Dealer/Distributor**

**INDIA**

### M/S ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar
Ganga Ram Hospital Square, Shankar Road
New Delhi – 110 060 India
Contact: Mr Harsh A Garg – Director
(All India Sales)
Tel: 011 494458800
Mobile: +91 11949458844
Fax: 011 27014413
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**TAIWAN**

### PAO TAI LNTERNATIONAL ENTERPRISE LTD

No.39, Lane 177, Dahua Rd
Jhongli City, Taoyuan County 320
Taiwan (R.O.C.)
Contact: Mr Sunter Sun
Mobile: 0933-114-090
Fax: 886-3-4632376
**Dealer/Distributor**

## DUPONT FIRE EXTINGUISHANTS

**CHINA**

### DUPONT CHINA HOLDING CO LTD

Shanghai Branch Building #11
No.399 Keyuan Road, Zhangjiang Hi-Tech Park
Pudong New District, Shanghai 201203
China
Tel: 86-21-38622270
Fax: 86-21-38622460
Email: in-bae.lee@dupont.com
**Representative Office**

**INDIA**

### E.I. DUPONT INDIA PRIVATE LTD

7th Floor Tower C, DLF Cyber Greens Sector-25A
DLF City, Phase-III, Gurgaon
Haryana 122 002, India
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Email: sumit.grover@dupont.com
**Representative Office**

**KOREA, REPUBLIC OF**

### DUPONT (KOREA) INC

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**Representative Office**

**MALAYSIA**

### DUPONT MALAYSIA SDN BHD

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Fax: +60 35 569-2994
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**SINGAPORE**

### DUPONT COMPANY (SINGAPORE) PTE LTD

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HarbourFront Tower One
Singapore 098633
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**Representative Office**

## Fike

**AUSTRALIA**

### FIRE PROTECTION TECHNOLOGIES PTY LTD

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Victoria 3149, Australia
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Fax: +61 3 9543 9109
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au
**Dealer/Distributor**

**BANGLADESH**

### MARS SYNDICATE

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Mohakhali Dhaka # 1206
Bangladesh
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Mr Akm Rasid Hassan Technical
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**Dealer/Distributor**

**CHINA**

### I-SAFE FIRE EQUIPMENT (TIANJIN) LTD

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Fax: +86 22 8882 6970
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**Dealer/Distributor**

**HONG KONG**

### THE JARDINE ENGINEERING CORPORATION LTD

5/F Tower A, Manulife Financial
223-231
Wai Yip Street
Kwun Tong, Kowloon
Hong Kong
Tel: 852 2807 4684
Fax: 852 2503 4210
Email: tommy.tam@jec.com
Website: www.jec.com
**Dealer/Distributor**

**INDIA**

### NEWAGE FIRE PROTECTION ENGINEERS

7, Champaklal Udyong Bhavan
Sion (E) Mumbai 400 022
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Tel: +91 22 2407 7421
Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com
**Dealer/Distributor**

**INDONESIA**

### PT. KALIMUTU MITRA PERKASA

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Fax: +62 21 5696 0497
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**Dealer/Distributor**

### PT. KENCANA LINTAS MENTARI

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Jakarta 10730, Indonesia
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Fax: +62 21 628 1976
Email: priyana@cbn.net.id
**Dealer/Distributor**

**KOREA**

### GM ENGINEERING & SUPERVISION CO LTD

Unit D-1209
Gwangmyeong Techno Park
#60 Haan-ro, Gwangmyeong-si
Gyeonggi-do, Korea
Tel: (82) 02-844-8588
Fax: (82) 02-846-9767
Mobile: (82) 010-5036-3123
Email: ts.jeong@gmens.co.kr
**Dealer/Distributor**

**MALAYSIA**

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Fax: +60 3 7859 1461
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Website: www.fike.com
**Representative Office**

### SUKIADA ENGINEERING SDN BHD

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40150 Shah Alam
Selangor
Malaysia
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Website: www.sukiada.com.my
**Dealer/Distributor**

**NEW ZEALAND**

### FIRE PROTECTION TECHNOLOGIES LTD

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Albany 0632
North Shore
Auckland
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Tel: +64 (09) 415 5488
Fax: +64 (09) 443 7867
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

**PAKISTAN**

### MGH ENGINEERING AND CONTROL PVT LTD

H. # 20 St.
#5/A Kot Shahabdin
Shahdrah
Lahore 54950
Pakistan
Tel: +92 42 7913064
Fax: +92 42 7913064
Email: mansoorshaker@yahoo.com
Website: www.mgheng.com
**Dealer/Distributor**

**PHILIPPINES**

### FIRE SOLUTIONS INC

1028 Malaya Street
Malanday Marikina City
1805 Philippines
Tel: +63 2 371 9774
Fax: +63 2 374 3041
Email: firesolutions@skyinet.net
**Dealer/Distributor**

**SINGAPORE**

### AZCEND ASIA PTE LTD

Blk 21
Kallang Avenue #04-165
Singapore 339412
Tel: (65) 6299 0798
Fax: (65) 6299 3735
Email: Chiaw.fs@azcendasia.sg
**Dealer/Distributor**

**SRI LANKA**

### BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD

122, Dawson Street
Colombo 02
Sri Lanka
Tel: +94 11 4717 500
Fax: +94 11 245 4653
Email: bldserv@sltnet.lk
**Dealer/Distributor**

**TAIWAN**

### SUNMORN INC

7F.-2, 76
Nan Jing W. Road
Taipei 10352
Taiwan
Tel: +886 2 2550 3500
Fax: +886 2 2550 5350
Email: merylyu@sunmoreinc.com
Website: www.sunmoreinc.com
**Dealer/Distributor**

THAILAND

**ANTI-FIRE CO LTD**

316-316/1, Sukhumvit 22 Road
Klongtoey
Bangkok 10110, Thailand
Tel: +66 2 260 4565
Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com
**Dealer/Distributor**

VIETNAM

**EUROPEAN TECH JSC**

No. 50, 218/27
Lac Long Quan Street
Tay Ho Dist., Hanoi
Vietnam
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Fax: +84 4 3755 7178
Email: mscee@vnn.vn
**Dealer/Distributor**

# FIRE FIGHTING ENTERPRISES

AUSTRALIA

**AMPAC TECHNOLOGY PTY LTD**

7 Ledgar Road
Balcatta
Western Australia 6021
Tel: +618 9242 3333
Fax: +618 9242 3334
Website: www.ampac.net
**Dealer/Distributor**

KOREA

**HI MAX CO LTD**

Sicox Tower
115-Ho 513-14
Sangdaewon-Dong
Jungwon-Gu
Sungnam-City
Kyungki Do, Korea
Tel: +82 31 769 7698
**Dealer/Distributor**

NEW ZEALAND

**AMPAC INDUSTRIES LTD**

PO Box 100-149
North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072
Fax: +64 94438073
**Dealer/Distributor**

SINGAPORE

**ACCLAIM SYSTEMS PTE LTD**

Blk 104
Boon Keng Road, 05-01
Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
**Dealer/Distributor**

**ALARM SUPPLY PTE LTD**

63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
**Dealer/Distributor**

TAIWAN

**HORING LIH IND CO LTD**

4f No 18 Lane 327 Chung Shan Road
Sec 2, Chung-Ho-City
Taipei Hsien, Taiwan
Tel: +886 2224 87599
Fax: +886 2224 07752
**Dealer/Distributor**

THAILAND

**TEEYA MASTER SYSTS CO LTD**

100/101-102 Vongvanji
Building B, 30th Flr
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: +662 2 6451130
Fax: +662 2 2488540
**Dealer/Distributor**

# FLIR SYSTEMS CO LTD

HONG KONG

**FLIR SYSTEMS CO LTD**

Rm 1613-16, 16/F Tower 2
Grand Central Plaza
No 138 Shatin Rural Commitee Road
Shatin, New Territories, Hong Kong
Tel: +852 2792 8955
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Email: flir@flir.com.hk
Website: www.flir.com
**Representative Office**

# HD FIRE PROTECT PVT LTD

AUSTRALIA

**HD FIRE PROTECT PTY LTD**

58/37, Slobodian Avenue
Eight Mile Plains
QLD – 4113, Australia
Tel: +61 433 194 344
Email: pacific@hdfire.com
**Representative Office**

INDIA

**HD FIRE PROTECT PVT LTD**

C-36, Nandanvan Industrial Estate
Lal Bahadur Shastri Marg
Opposite ACC Research Centre
Thane, Mumbai
Maharashtra 400604, India
Tel: +91 22 2582 6958
Email: info@hdfire.com
Website: www.hdfire.com
**Representative Office**

INDONESIA

**PT. TRIMITA WUJUD REKANUSA**

Jl. Gunung Sahari Raya 51/8
Jakarta Pusat 10610
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Tel: +62 21 4227632
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**Dealer/Distributor**

# HOLMATRO

AUSTRALIA

**CHUBB FIRE & SECURITY**

149-155 Milton St Ashfield, NSW 2131 Australia
Tel: +61 392 649 796
Email: Rob.Watson@chubb.com.au
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**Dealer/Distributor**

BANGLADESH

**SPERRY INTERNATIONAL**

5/5 Block-A, 1st Floor, Iqbal Road
Mohammedpur Dhaka-1207 Bangladesh
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Email: SMNazrul@sam-sperry.com
Website: http://www.sam-sperry.com
**Dealer/Distributor**

BELGIUM

**VANASSCHE FFE**

Bruggesteenweg 2-4 8531 Harelbeke Belgium
Tel: +32 567 101 30
Email: info@vanassche-fire.be
Website: http://www.vanassche-fire.be
**Dealer/Distributor**

BHUTAN

**TCD TRADER**

PO Box 792 Changjalu, Thimphu Bhutan
Tel: +975 178 328 53
Email: TDorji212@gmail.com
Website: http://www.tcdtrader.com
**Dealer/Distributor**

BRUNEI

**IECS**

8A Simpang 558, Jalan Pasir
Kampong Berakas BB1314 Brunei Darussalam
Tel: +673 877 79 68
Email: IECS.Brunei@gmail.com
**Dealer/Distributor**

FIJI

**PIONEER SUPPLIES**

161 Toorak Road Suva Fiji Islands
Tel: +679 331 27 37
Email: Mahesh@pio-sup.com
Website: http://www.pio-sup.com
**Dealer/Distributor**

INDIA

**RESQ TECHNOLOGIES**

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Email: RESQ.Technologies@gmail.com
Website: http://www.resqtechnologies.com
**Dealer/Distributor**

INDONESIA

**ESA KARYA MANDIRI**

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MALAYSIA

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Darul Ehsan 40400 Malaysia
Tel: +60 351 221 310
Email: PNSB@pn.com.my
Website: http://www.pn.com.my
**Dealer/Distributor**

NEW ZEALAND

**CHUBB FIRE & SAFETY PRODUCTS**

3 Fisher Crescent (Private Bag 92207)
Mt Wellington
Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: http://www.chubb.co.nz
**Dealer/Distributor**

PHILIPPINES

**WALLGREEN INDUSTRIAL VENTURES CORP**

62 West Avenue
Quezon City
1104 Philippines
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**Dealer/Distributor**

SINGAPORE

**ADVENTRA**

48 Changi South St. 1 486130 Singapore
Singapore
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Email: PK.Tan@adventra.com.sg
Website: http://www.adventra.com.sg
**Dealer/Distributor**

SRI LANKA

**HALCHEM LANKA**

No 07, Siri Dhamma Mawatha
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Tel: +94 112 677 941
Email: inquiries@halchem.net
Website: http://www.halchem.net
**Dealer/Distributor**

THAILAND

**CHASE ENTERPRISE (SIAM)**

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Bangyeekhan, Bangplad
Bangkok 10700 Thailand
Tel: +66 281 940 00
Email: ChaseSiam@chasesiam.com
Website: http://www.chasesiam.com
**Dealer/Distributor**

VIETNAM

**WETEC TECHNOLOGY EQUIPMENT**

10th Floor, 9 Lang Ha
Ba Dinh District Hanoi Vietnam
Tel: +84 945 582 626
Email: Khoa.TD@wetec.vn
Website: http://www.wetec.vn
**Dealer/Distributor**

## HUSQVARNA CONSTRUCTION PRODUCTS

**AUSTRALIA**

### HUSQVARNA AUSTRALIA PTY LTD

4 Pioneer Ave,
Tuggerah, NSW 2259, Australia
Tel: +61 1300 487 782 Fax: +61 8 8371 0990
Website: www.husqvarnacp.com.au
**Representative Office**

**CHINA**

### HUSQVARNA FAR EAST LIMITED

38, Xin Jia Road, Colliman Industrial Park
Haicang Xin Yang Industrial District
361022 Xiamen, Fujian Province, China
Tel: +86-592 6518 940
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**HONG KONG**

### OWP (HONG KONG) CO

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**Dealer/Distributor**

**INDIA**

### PRIME TECHNOLOGIES

LP-40 E, Maurya Enclave
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**INDONESIA**

### PT BINA BARUTAMA SEJAHTER

Jl. Pangeran Tubagus Angke No. 22K
Jakarta Barat 11460, Indonesia
Tel: +62 21 5606192
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Website: www.binabarutama.com
**Dealer/Distributor**

**KOREA**

### KYUNG JIN INTERNATIONAL LTD

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Dongdaemun-Gu, Seoul, Korea
Tel: +82 2 2238 2187
Email: hoon@kyungjinltd.com
**Dealer/Distributor**

**MALAYSIA**

### DEFIX CONCRETE PRODUCTS SDN BHD

No 1, Lorong Jintan 2, Taman Supreme,
Off Jalan Cheras, 56100, Malaysia
Tel: +6-03-91348600
Email: defixcp@gmail.com
**Dealer/Distributor**

**PHILIPPINES**

### CUT & BREAK DIAMOND PRODUCTS INC

142 West Avenue, Barangay Philam
Quezon City 1104, Philippines
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Fax: +632-436-1059
Email: cutandbreak@gmail.com
**Dealer/Distributor**

**SINGAPORE**

### LAND EQUIPMENT PTE LTD

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Website: www.land-equipment.com.sg
**Dealer/Distributor**

**TAIWAN**

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Haicang Xin Yang Industrial District
361022 Xiamen, Fujian Province, China
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**THAILAND**

### SPICA CO LTD

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**VIETNAM**

### VISION JOINT STOCK CO

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**Dealer/Distributor**

## K.V. FIRE CHEMICALS (INDIA) PVT LTD

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## LION INTERNATIONAL

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## NEWAGE INDUSTRIES

**INDIA**

### NEWAGE INDUSTRIES

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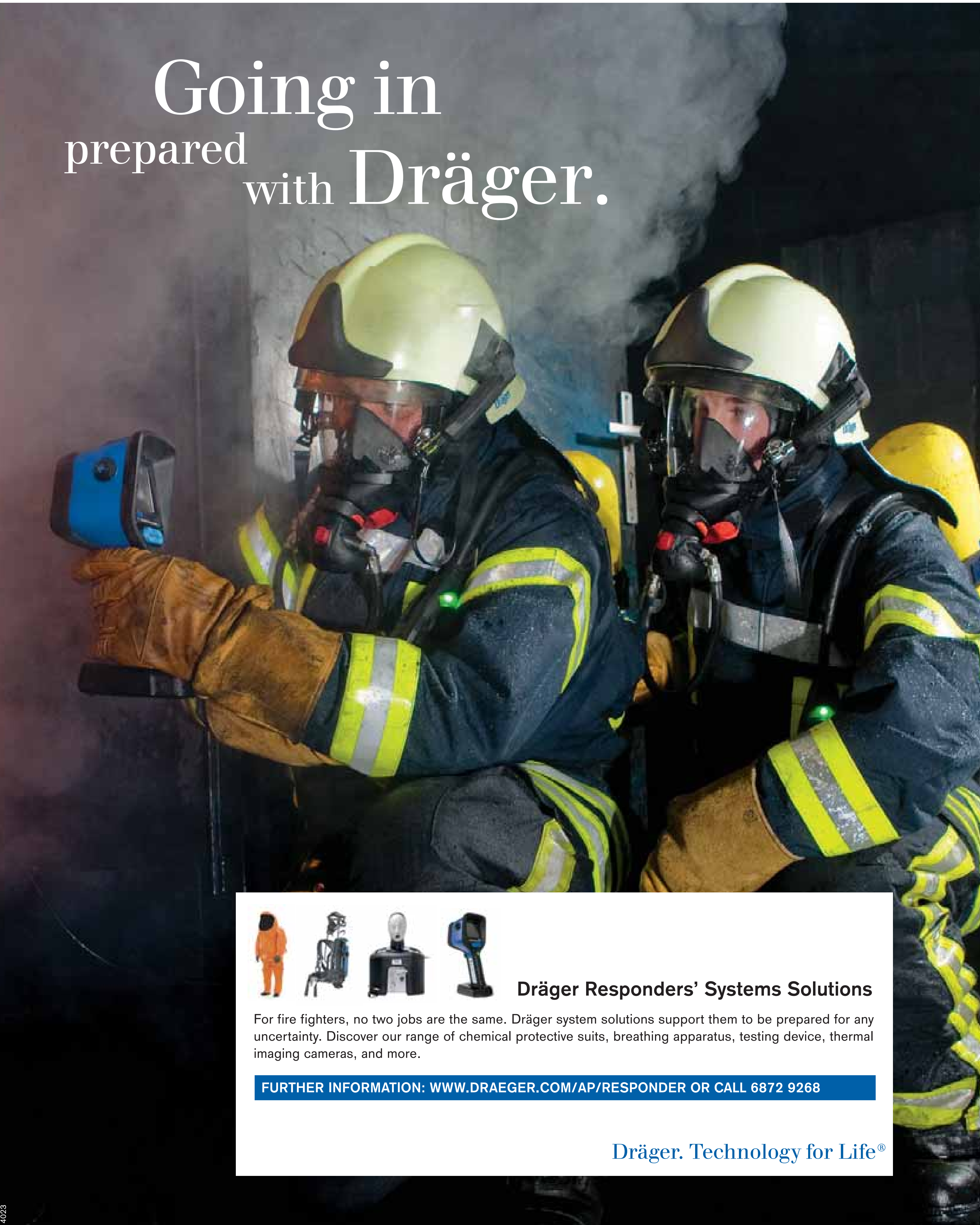

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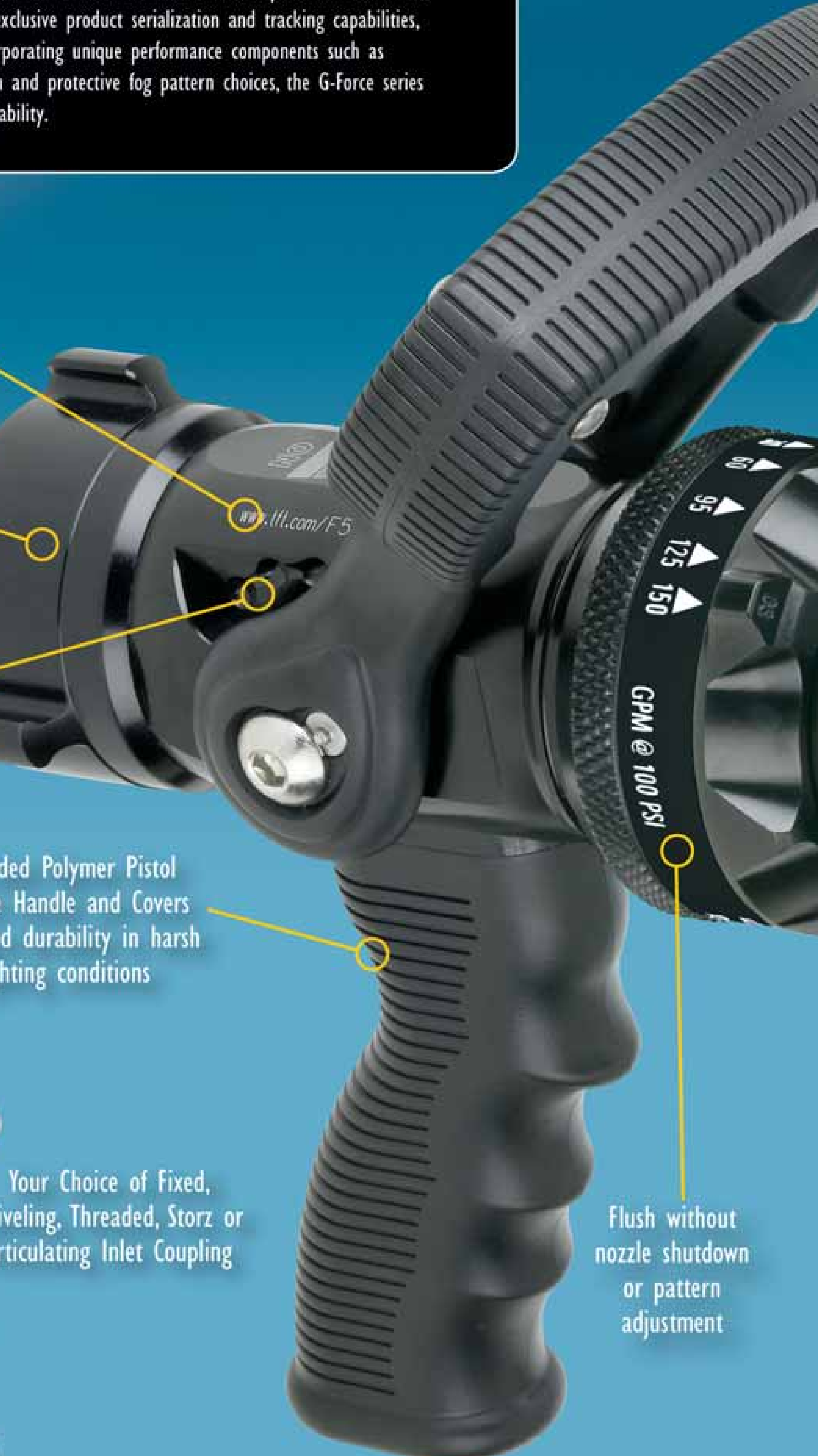

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## June 2013
## Issue 46

An MDM PUBLICATION
Issue 46 – June 2013
APF
www.mdmpublishing.com
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Front cover: One of two new mobile command vehicles for the state of Victoria's Country Fire Authority, with mobile satellite broadband and integrated communications supplied by Excelerate Technology Group. The vehicle specialist is Mills-Tui.

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APF is published quarterly by:
MDM Publishing Ltd
The Abbey Manor Business Centre,
The Abbey, Preston Road, Yeovil,
Somerset BA20 2EN, United Kingdom
Tel: +44 (0) 1935 426 428
Fax: +44 (0) 1935 426 926
Email: mark.seton@apfmag.com
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ISSN – 1476-1386

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Page design by Dorchester Typesetting Group Ltd
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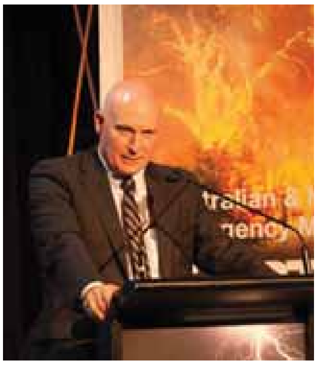

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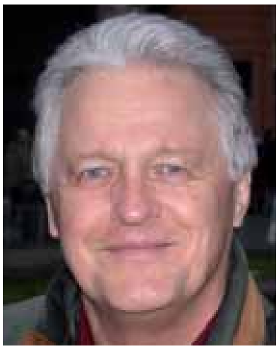

**Graham Collins**

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# Time for Action

Recent events in the region have, once again, tested individual country's ability to respond to a natural or man-made disaster.

In China, at least 160 people died and more than 6,700 were injured when an earthquake that was measured by the US Geological Survey at 6.6 struck the hills around Lushan county in Henan Province. The shallowness of the earthquake's depth at less than 13 kilometres probably magnified the impact. Roads were blocked and power and phone services cut off.

In Bangladesh, the death toll following the collapse of an eight-storey building housing five garment factories current stands at more than 1100, making it the country's worst-ever industrial disaster. The final death toll in one of the world's poorest countries is yet to be determined and, weeks after, disaster recovery efforts are continuing. And if that was not enough for the Bangladesh authorities to contend with, a couple of weeks after the building collapse, a fire in a garment factory in the Mirpur industrial district of the city killed at least eight people.

**Some parts of the world are simply more prone to natural disasters; some are better prepared and equipped to respond and deal with the aftermath. Ignoring building standards and poor enforcement are at the heart of many high-casualty collapses and fires.**

Just a few months earlier an earthquake measuring 8.0 set off a tsunami killing five people in a remote part of the Solomon Islands. It prompted evacuations across the South Pacific as island nations issued tsunami alerts. The Pacific Tsunami Warning Centre in Hawaii issued warnings for the Solomon Islands and other South Pacific nations including Australia and New Zealand. Although measuring just 0.9 metres it swamped some island villages and one island's main airport.

So, what do these and similar events tell us?

One answer is that, when it comes to natural disasters, some parts of the world are simply more prone to earthquakes and tsunamis, while some countries are better prepared and equipped than others to respond to a disaster and better able to deal with the aftermath. As far as man-made disasters go, ignoring building standards and poor enforcement are at the heart of many – although by no means all – high-casualty collapses and fires.

Some of the less developed countries are plagued by both challenges. They are frequently on the receiving end of earthquakes, floods and the like; at the same time construction standards are either non-existent or not enforced due to apathy, inadequate policing or simply a willingness to turn a blind eye. The same applies to fire safety standards that, I suspect, have little chance of being taken seriously in a culture or an environment where overall building standards are ignored and where cutting corners is endemic.

The government's official response to the garment factory fire in Bangladesh was that safety will, in future, be given "the highest consideration". Fine words that have a familiar ring about them; we can only hope that this time the commitment is not scuppered. In a recent editorial in *Asia Pacific Fire's* sister publication, *International Fire Protection*, under the headline *Deeds not Words*, I argued the importance of focusing on action; that having standards and codes was of little or no value if they are ignored by those that should be working to them, or not rigorously enforced by those whose job it is to ensure compliance.

The realist in me tells me that in some countries this will take years, decades, possibly even generations to achieve, such is the scale of the task, the lack of availability of funds, inadequate resources and disempowering ways of doing business or making a living that are centuries old. But we have to start somewhere. We could discuss endlessly whether we do this by bringing political pressure to bear, demanding that those companies trading with these countries demand compliance as a condition of trade, providing financial or training support or, particularly in the case of fire protection, firefighting and rescue, donating equipment. Or, instead of discussing the options, perhaps we could all just get on with the job and take action today so that, in future, fewer lives are lost. **APF**

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# Our Global Challenge

**James M. Shannon**

NFPA

The first reports of a deadly fire in Brazil in January sounded all too familiar; an overcrowded nightclub, pyrotechnics, a raging fire, no sprinklers, too few exits, horrific losses. The fire at the Kiss club in the city of Santa Maria ultimately claimed 242 lives and injured hundreds more.

Ten years ago, a fire at the Station nightclub in Rhode Island killed 100 people. The similarities between the Kiss and Station fires are striking: too many people were crammed into too small an area in violation of legal limits; there were no fire sprinklers; untreated polyurethane foam was used for soundproofing and contributed to the spread of the fires; and the fires were caused by incendiary devices used by bands as part of their acts.

Since the Station fire, similar events have occurred all over the world. In 2009, an indoor pyrotechnics display started a fire in a nightclub in Bangkok, Thailand, that killed more than 60 people and injured scores. That same year, more than 150 died when pyrotechnics sparked a fire in a club in Perm, Russia. In 2004, a patron shot a flare in the Cromagnon nightclub in Buenos Aires, Argentina, killing almost 200. The same questions were asked after each event: How could this happen? How can we make sure it never happens again?

Soon after The Station fire, NFPA convened its Technical Committee on Assembly Occupancies and adopted numerous code changes including lowering the occupancy threshold for when fire sprinklers are required. We were also very active in getting the word out on how dangerous nightclubs can be if special care is not taken to make them safe. We have made progress at getting states to strengthen their fire codes, and many communities have stepped up their enforcement.

The Kiss fire was a national tragedy in Brazil. The president left a summit meeting of Latin American leaders to return to the country to help the survivors and the rest of the public through the ordeal. The media rushed to gather facts and help the public understand what had happened, and they found much of what they needed at NFPA. Since The Station fire, we have maintained a trove of information about nightclub fires that was widely cited in the Brazilian media. NFPA staff were interviewed and quoted on Brazilian TV and in newspapers.

But we will not stop there. Our mission is not just to collect historical and technical information about fires but to do what we can to prevent these events from being repeated. We have been asked to provide technical advice to the State of Rio de Janeiro as it revises its fire code, and we are sending technical staff there to help as officials review their codes. We hope we can provide similar help across Brazil, including in the state of Rio Grande do Sul where Santa Maria is located.

> **The NFPA's mission is not just to collect historical and technical information about fires, but to do what we can to prevent these events from being repeated – to save lives and protect property from fire and other hazards.**

NFPA's mission is to save lives and protect property from fire and other hazards. It is disheartening to see tragedies like these, because we know that the lessons learned from our past experiences can prevent them. Technology has made it much easier for NFPA to reach people in every corner of the world, and it has also made it our obligation to work even harder to make NFPA a global force for fire safety. APF

This Foreword appeared originally in the March/April 2013 issue of the NFPA Journal.

**James M. Shannon** is NFPA's President and CEO

For further information, go to www.nfpa.com

# New Advanced Vapour Suppression Spheres

Material engineering company, TRELLEBORG, has developed an advanced composite material specifically designed as a fire and vapour suppression agent for large storage tanks containing hydrocarbon polar or non-polar fuels.

Applied as a semi-permanent vapour barrier, or used as an additive to fire-fighting foam, the new Vapour Suppressing Spheres create a barrier between both polar and non-polar flammable liquids and the vapour space above. As the product is capable of handling high temperatures and has an oil repellent outer coating, the barrier lasts indefinitely compared with the temporary barrier that traditional 'wet' foam provides, therefore eliminating the need for continuous re-application.

The individual spheres, which vary in size from 3mm to 5mm, are applied dry and self-assemble into a foam-like structure that is lighter than both oil and water. The resulting 'foam' suppresses vapours to the point of extinguishing the liquid hydrocarbon fires. Unlike traditional water-based foams, the dry foam fire suppression spheres work without freezing or bubble degradation, and do not contain fluorosurfactants. Since the spheres do not rely on water to put out fires, they are most suitable for applications where water is scarce and in regions of the world where low temperatures pose freezing issues.

Another application for the Vapour Suppression Spheres is in chemical storage tanks that, due to safety reasons, cannot have a physical roof. The company recently completed an extensive in-house and third-party testing program to quantify the ability of the spheres to function as a semi-permanent floating roof; an alternative to the traditional foam solution. The conclusions indicated that a 150mm layer of spheres could provide a suppression evaporation rate of hydrocarbon up to 98 percent of that in a tank with no spheres.

The spherical shape and specific gravity of the spheres allow them to spread easily and in layers, providing improved blockage of vapour paths.

**For more information, go to www.trelleborg.com**

# The Cobra Strikes!

The new Cobra EXM from ELKHART BRASS is being heralded as delivering: "… big water in a small package. Smaller, lighter and more affordable than anything in its category…".

Taking advantage of Elkhart's EXM operating system, the Cobra delivers up to 5678 litres-a-minute with what the company claims is less friction loss than competitive monitors; it has symmetrical design for efficient and smooth operation and comes as a compact package that works in the tightest spaces. Rugged components, such as thrust rods and bearings, deliver ten-times greater durability, plus the Cobra offers fully programmable travel speeds, stow and oscillation. It has easy-to-use, two-way fibre-optic controls that allow wired or wireless operation and simple plug-and-play electronic components.

**For more information, go to www.cobraexm.com**

# Total Flooding Solution

FIRETRACE INTERNATIONAL has announced the successful completion of its first Firetrace Total Flooding Systems installation in Pakistan. The order for the recently launched full-room, total flooding gaseous fire suppression system is now protecting the Karachi headquarters of Lotte Pakistan PTA Ltd.

The solution is providing around-the-clock protection for the company's essential IT installations and server room.

Among the reasons cited for selecting the Firetrace solution was the lower financial outlay when compared with similar systems on the market, significantly improved design freedom, the opportunity to embrace sustainability and achieve minimal environmental impact by using proven clean agent technology. The Lotte Pakistan PTA installation utilised DuPont FM-200 gaseous fire suppression agent.

**For more information, go to www.firetrace.com**

# New Aviation Firefighting Training Facility

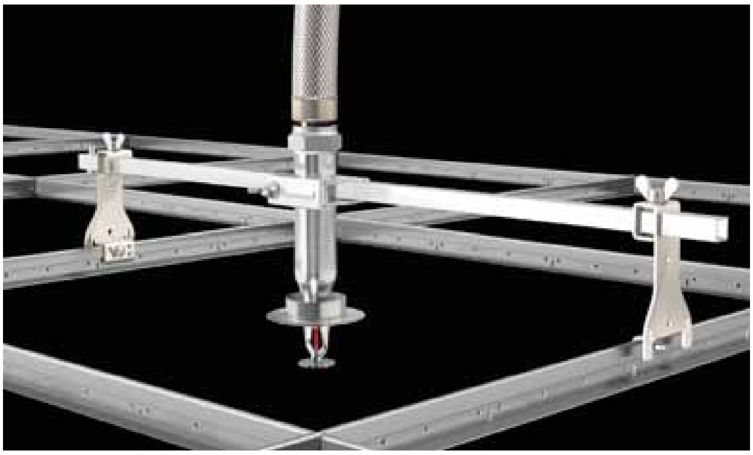
AIRSERVICES has officially opened a new fire training facility at Melbourne Airport in Australia – the Learning Academy Hot Fire Training Ground (LAHFTG), part of Airservices' AUD $140 million investment over the next five years to modernise its Aviation Rescue and Fire Fighting (ARFF) facilities that will also include new fire vehicles and refurbishment of fire stations.

Airservices provides ARFF services at 21 of Australia's busiest airports and is one of the world's largest providers of aviation rescue and fire fighting services. It has more than 740 operational and support personnel, allowing Airservices to respond rapidly to a broad range of airport emergencies. The new training facility will support ARFF training capabilities and equip firefighters with the competencies required to deal with large, complex airframes.

The centrepiece of the new training ground is a full-sized mock-up aircraft fuselage replicating sections from the Airbus A380 and Boeing 767. Airservices has also put in place stringent environmental control systems in order to minimise the impact of the training activity on the surrounding environment.

**For more information, go to www.airservicesaustralia.com**

# New Sprinkler Bracket



Mechanical pipe joining and fire protection systems company, VICTAULIC, has introduced a new Style AB1 bracket and renamed the AquaFlex sprinkler system product line to the VicFlex sprinkler fitting system.

VicFlex is said to offer fast and dependable installation, durable performance and is cost effective for maintenance and retrofit applications, requiring fewer man hours to install while lowering shipping costs with its more compact form. It is being promoted as being a convenient and safe solution that is easier to position than rigid pipes.

The new Style AB1 bracket eliminates the need for sprinkler installers to handle ceiling tiles, cut holes in ceiling tiles and coordinate with the ceiling trade on site, reducing hands-on installation time by as much as 39 percent.

**For more information, go to www.victaulic.com/vicflex**

# Li-ion Battery Fire Research

Commercial and industrial property insurer, FM GLOBAL, has completed the first-ever large scale fire tests of lithium-ion (li-ion) batteries in warehouse storage and released a research technical report describing the associated fire hazards and protection recommendations for these increasingly popular rechargeable batteries.

The project was conducted in conjunction with the Property Insurance Research Group (PIRG) through the National Fire Protection Association's (NFPA) Fire Protection Research Foundation to better understand the fire hazards at the forefront of this prevalent technology.

The key findings of the research included that li-ion batteries present several unique fire hazards when involved in a fire, due to an ignitable electrolyte liquid contained within such products. It also concluded that densely packed li-ion cylindrical cells and polymer cells behave differently than li-ion power tool packs in such fires; also that, when bulk stored in corrugated board cartons, early fire extinguishment and cooling of the li-ion batteries is imperative to properly protect a facility. It was also found that existing protection solutions used for other types of high hazard products and materials can be effective for protecting li-ion batteries stored in bulk arrangements.

The complete research findings are available in a downloadable technical report "Flammability Characterization of Lithium-ion Batteries in Bulk Storage" at www.fmglobal.com/researchreports.

**For more information, go to www.fmglobal.co.uk**

# Misting Rehab Tool

A easy to use and low cost rehabilitation tool designed to prevent heat related injuries and fatalities in firefighters is being promoted by HEATSEEKER TECHNOLOGY & DESIGN.

The award-winning Heatseeker incorporates six misting nozzles and is designed to attach to an existing standard 63.5mm apparatus pump discharge to deliver a cooling mist. It replaces the cap that is used to keep debris out of the pumps, so no set up is needed and Heatseeker is ready for immediate action. It utilises a minimal amount of water, and has the ability to cool an area up to an angle of 30 degrees. When not discharging a water mist, the Heatseeker cap continues to keep debris out of the pump.

Heatseeker was designed and built by firefighters in the USA. This simple technology compares with the complexity, cost and lengthy set-up time of conventional misting fans that, additionally, take up valuable space on the fire truck, need power and a separate water supply.

**For more information, go to www.firegroundrehab.com**

# Sprinkler Review

STANDARDS NEW ZEALAND has announced that the New Zealand standard for Automatic fire sprinkler systems, NZS 4541:2007, is undergoing a limited technical review. A new version of the Standard, NZS 4541:2013, is expected to be published in mid-2013.

As this is a limited technical revision of the standard, the committee is focusing on addressing only the specific issues within the scope of the project. The committee is not completely rewriting the Standard. It covers the design, installation, and maintenance of sprinkler systems so that systems reliably achieve their fire control functions – that the fire should be controlled within a specified area and that control should be achieved before levels of toxic by-products of combustion become life threatening.

**For more information, go to www.standards.co.nz**

# Simulation in Japan

ARGON ELECTRONICS has appointed Teisen (Teikoku Sen-I Co Ltd) as its new sales partner in Japan to provide CBRN and HazMat simulation equipment to the Japanese market.

Argon's CBRN simulation equipment is designed to replicate exactly the real-life instrumentation familiar to first responders. Used in conjunction with the company's simulation software and analytics tools, these instruments provide comprehensive feedback in real time to students and instructors. This allows training exercises to be completed safely and efficiently; developing the skills of personnel, while providing valuable data that can be used to refine subsequent training and simulation programmes.

**For more information, go to www.argonelectronics.com**

# Boosted Power

AMKUS RESCUE SYSTEMS has introduced its latest innovation in high-performance extrication tools and equipment, the GH2B-MCH mini power unit. It offers two-tool simultaneous operation with "boost" mode. When in alternate operation, "boost" mode will increase tool speed in both pump stages. Weighing in at approximately 26kg, the compact and portable unit comes with a carrying handle. The modular design reduces the time spent on servicing.

**For more information, go to www.amkus.com**

# Thermal Imaging's New Benchmark

## FLIR sets new a new benchmark for cost-effective thermal imaging

FLIR is a brand that is already well-known in the firefighting sector. For many years it has been the preferred choice of many OEMs and systems integrators that require high performance thermal cores to provide clear and reliable thermal imaging. Now, the company has re-entered the equipment market too. Using its proven detector core technology, it has developed the FLIR K-Series range of thermal imaging cameras that has instantly become market leaders in terms of value for money.

Thermal imaging is an essential fire attack tool and those specifying infrared cameras know exactly what is needed in terms of price and performance in compliance with NFPA recommendations. So when a new product is introduced that offers more features for less money, the market instantly takes notice. This is precisely what has happened with the new FLIR K-Series radiometric thermal imaging cameras.

These new products were introduced in April 2013 and within a month more than 100 have been sold and judging from visitor reaction at the recent FIREX 2013 exhibition in the UK, this is just the tip of the iceberg.

### Volume Manufacture

FLIR Systems' status as the world leader in portable thermal imaging is key to this early success. Not only has the company been able to factor-in features developed for harsh industrial environments, it has also taken advantage of manufacturing economies.

The company manufactures many thousands of camera units a year and this puts FLIR Systems in the unique position of being able to offer highly valuable products at affordable prices, delivering the benefits of thermal imaging to the widest possible user-base.

The new, firefighting FLIR K-Series is based on an industry lead core that provides either 240 by 180 pixels or 320 by 240 pixels for those requiring the best image clarity. Both models have a bright 100mm LCD display and are designed to meet the toughest operating conditions; for example, they will withstand a drop of two metres onto a concrete floor and are water resistant to IP67.

The object temperature range of the cameras is up to +650°C and these models will withstand operating temperatures of 260°C for up to five minutes. Camera control is via three large buttons on top of the camera designed to be easily operated with a gloved hand. The torch-style grip is well proven in the industrial market. It is ideal for single handed operation and, unlike a monocular or binocular camera, can be used when the firefighter is moving. The design provides a clear, crisp image at arm's length while allowing good situational awareness.

The camera's ability to measure temperature provides the firefighter with an important sixth-sense. For example, the K-Series is able to show if a fire is burning behind a wall. A quick thermal profile of the scene also highlights areas that remain in danger of re-combustion and enables the user to confirm when the fire has been successfully extinguished.

Although primarily designed for fire attack, the camera is also suitable for use in any search and rescue situation. Up to 200 thermal images can be stored in-camera and later used to enhance a post-incident report. In common with all FLIR portable thermal imaging cameras, every K-Series camera carries a two-year product warranty that complements its ten year detector warranty. Also included in the purchase price is a hard transport case, FLIR Tools software, power supply, two re-chargeable batteries and charger, USB cable, lanyards, neck strap and tripod adaptor.

### Video Smoke Detection

A second new introduction further emphasises FLIR Systems commitment to the fire sector. FLIR can now provide video smoke detection on IP surveillance cameras. Ideal for use in high or voluminous buildings, the FLIR video smoke detection software provides real-time visual verification, allowing operators to assess the nature and severity of the fire.

This field-proven system has extremely low false alarm rates and high detection rates and is therefore a cost effective and highly reliable early warning system. APF

For more information, go to www.flir.com

# ATEX/IECEx Certified Light

APPLETON has announced that its Mercmaster LED series for industrial and hazardous environments that was launched almost three years ago is now certified for use in ATEX/IECEx hazardous locations.

The Mercmaster LED is designed to help keep workers safe in environments containing potentially explosive gas and dust, and is claimed to offer lower weight, greater shock resistance, cold start capabilities, minimal heat production and outstanding energy-efficiency. It features a single-piece, lightweight aluminium body that accommodates upgraded LED arrays generating light outputs from 2,300 lumens to 6,075 lumens, an equivalent of 70W HID to 175W HID lamps. Four lumen output versions are available with universal drivers covering voltage requirements from 120 to 277.

To assist in installation and maintenance, each fixture is supplied with terminals to assure straightforward wiring, along with a threaded impact-resistant lens for faster removal. A hinge design promotes safety during installation and servicing, while also providing 360° compression on the ballast housing gasket. In addition, the new heat-sink design prevents dust and debris from accumulating on the fixture, while an improved silicone rubber gasket seals out moisture, dirt and dust.

**For more information, go to www.appletonelec.com**

# PPE Showcased

LHD GROUP HONG KONG showcased its Lion brand of personal protective clothing for firefighters and rescue services at the recent China Fire exhibition in Beijing. The line-up included Pro-Tek Max and V-Force turnout gear that is available in several material compositions and colours. The company also showed for the first time in China, a new type of heat protection fibre called Lenzing.

**For more information, go to www.lhd-group.com**

# Breathe Easy

ESSEX INDUSTRIES has unveiled Victim Rescue Unit Plus (VRU+), a light-weight, self-contained protective breathing device for use in emergency egress and escape situations. The unit takes just seconds to don and provides 360° visibility while supplying aviator's grade oxygen to the wearer. The VRU+ can protect a user's respiratory system, head and vision from fire, toxic fumes, hazardous chemical spills, and sarin and mustard gases for up to 60 minutes.

**For more information, go to www.essexindustries.com**

# New Safety Furnace

Independent fire and security testing, fire engineering and certification organisation, EXOVA WARRINGTONFIRE, has unveiled a new $1.6 million resistance furnace as part of its Dandenong facility near Melbourne in Australia, reckoned to be the first furnace of its kind in Australia. The full scale, high capacity fire resistance test furnace is capable of testing horizontal and vertical constructions in compliance with the toughest local and international fire test methods.

**For more information, go to www.exova.com**

# SERV FA50 Boosts Efficiency & Safety

Gradall Industries introduces the SERV FA 50 for greater firefighting efficiency and safety.

GRADALL INDUSTRIES has introduced the Strategic Emergency Response Vehicle [SERV] FA 50 firefighting device, designed to be mounted on a fire truck to dramatically increase firefighting efficiency and safety.

The rugged Gradall hydraulic boom can telescope out 15.2 metres and uses a stainless steel 5th-man water cannon to ventilate buildings by breaking through walls and roofs as well as reaching through windows; rotating up to 220 degrees or swinging to the left and right. Once inside a burning structure, the 5th-man nozzle has 52 aqua-jet nozzles that direct a massive broken stream curtain of water (or Class A or Class B foam for chemical fires) into the fire.

Firefighters can control the FA 50 from over 61 metres away, using a wireless remote control device. This allows the firefighter to precisely position the apparatus with an easy-to-use system of controls on the belt-held remote device. For extra fire truck stability, the FA 50 is equipped with four stabilisers that are also controlled with the wireless remote. The stabilisers telescope out and down and can be positioned all at once or independently, providing short jacking capabilities. APF

**FA 50 Specification**

Weight: 10,433 kg.

Two hydraulic motors: Swing 20hp (15kW) at 1.0 rpm; tilt 20hp (15kW).

Hydraulic system: 0 to 160 litres-a-minute, up to 400 psi.

Telescoping boom: Reach 15.2 metres, rotation 110 degrees, tilt left or right.

5th-man water cannon: 5678 litres-a-minute and 120 psi, Class A and Class B foam.

Oil capacity: 208 litres.

For more information, go to www.gradallserv.com

# The Virtually Indestructible, Indestructo Decontamination Shower

When emergency decontamination conditions require equipment that will withstand more than your standard wear and tear, make sure your decontamination shower is as prepared as you are, with the Indestructo Decon Shower.

A recent individual assessment of the Indestructo in FireRescue magazine found it to be a: "great addition to a hazmat arsenal." The reviewer, an Assistant Fire Chief and Deputy Fire Marshal, observed that the shower was easy to assemble, easy to manoeuvre and work around, and the shower spray to be even and complete.

The Indestructo is highly resilient, and designed to hold up to the most rugged emergency responder conditions. The Indestructo is constructed of the lightest and strongest break-resistant pipes and fittings on the market – ABS thermoplastic. ABS is stronger and more rigid compared with PVC, which has less resilience and is more prone to breaking. The shower assembles quickly using quick-connecting locks and has a fully-collapsible design. The shower is stored in a vinyl bag, which makes it easy to transport to HazMat scenes.

The shower's specially designed showerheads remove effortlessly for cleaning, maximising the shower's longevity. The five showerheads have a total output of 57 litres-a-minute for full, complete water coverage, creating a "wall of water". Two windscreens reduce overspray and maintain the shower's effectiveness. The shower has a single water inlet that can be connected to a standard garden hose. The shower can be set up in under three minutes to ensure a quick response time.

The Indestructo shower system includes:

- One Indestructo Decon shower.
- Handheld sprayer with a 200mm hose.
- Delta frame collection pool.
- Elevation grid.
- Two wind screens.
- Black vinyl carry bag.
- Mesh bag to hold windscreens.

The delta frame collection pool included with the Indestructo show system has a unique triangle sidewall that gives it sturdy containment support without the need for L-brackets or bulky foam. The collection pool is constructed using 0.6 kilogram PVC material for added chemical resistance and durability.

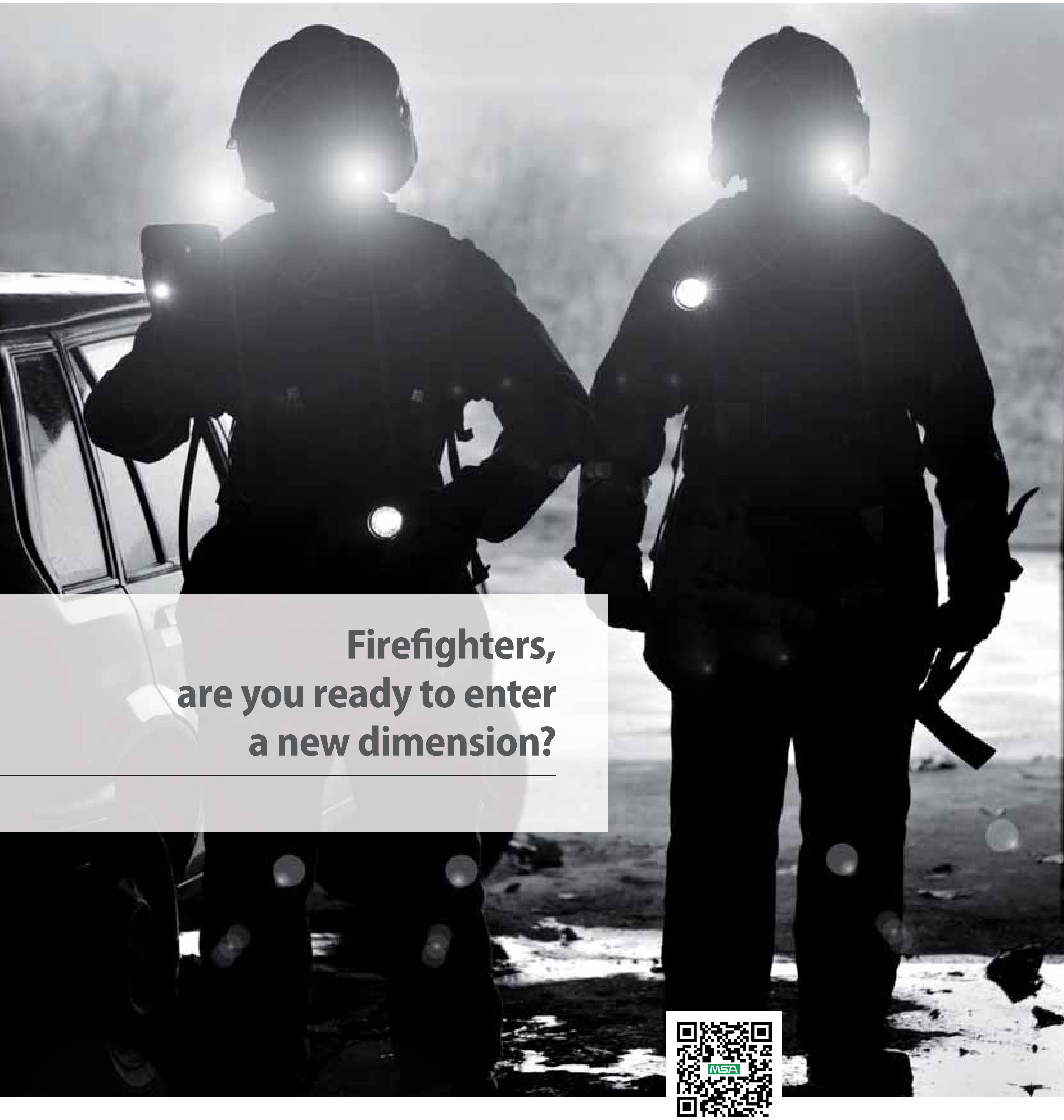
The Indestructo is part of a broad DQE line of decontamination shower systems including the Standard Decontamination Shower, Decono, Quick Response, and more. These showers are designed by hazmat team experts for durability, quick set up, and ease of use.

Headquartered in Fishers, Indiana, DQE, Inc. designs and sells essential products that emergency responders depend on to enhance their jobs while saving lives. **APF**

For more information, go to www.dqeready.com/Decon

MSA **Safety solutions**

The Safety Company



Find out more… www.MSAsafety.com/f1xf

*Because every life has a* ***purpose...***

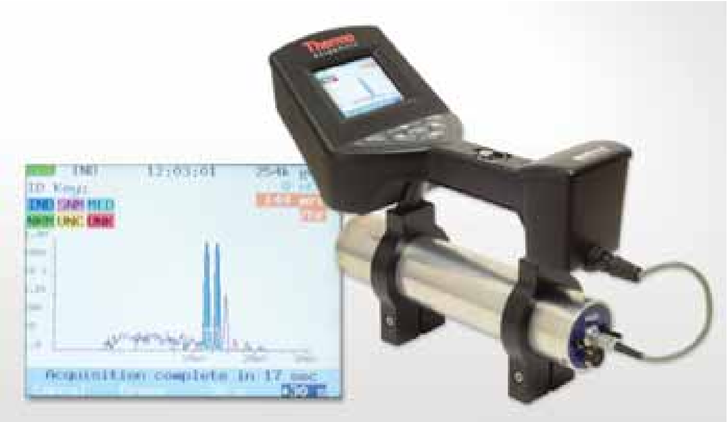
# Chinese Chassis Deal

PIERCE MANUFACTURING has announced an agreement with FAW Bus and Coach Co of Changchun, China whereby Pierce will manufacture fire truck bodies and crane-mounted rescue bodies in the USA that will then be exported to China where they will be mounted on FAW chassis.

In addition to the trucks jointly produced with FAW, Pierce will also continue to export to China its complete USA manufactured custom fire trucks built on Pierce custom chassis. This will offer Chinese customers a wider selection of vehicle choices to meet and exceed China's GB 7956 firefighting vehicle standards and China Compulsory Certificate for Fire Fighting Equipment (CCCF) product certification requirements.

**For more information, go to www.piercemfg.com**

# New CBRN Spectrometer



ARGON ELECTRONICS has launched the RIIDEye-SIM-NaI-P, a spectrometer simulation probe that enables responders to train how to use the Thermo RIIDEye handheld radiation isotope identifier without an ionizing radiation source. The probe is the latest innovation from the company that enhance both the quality and safety of CBRN training and is based upon Argon's use of ultrasound and RFID (radio frequency identification devices) to simulate hazardous material.

With the RIIDEye-SIM-NaI-P installed, CBRN trainers can plan exercises in which the RIIDEye responds to Argon's GS3 gamma radiation simulation source, which can be set to represent specific nuclear isotopes such as Cs137 and Co60. The simulator probe is also PlumeSIM compatible, permitting radionuclide identification exercises to take place in either virtual table-top or large area field exercises involving scenarios such as radiological dispersion devices or a nuclear power station accident. All RIIDEye audio and visual alarm functions are maintained throughout the simulation exercise, as well as the data down-load capability.

The new spectrometer has also been designed to provide long, uninterrupted service during training. The probe is powered by a separate integral rechargeable battery and requires no preventative maintenance or recalibration. Argon has also launched the SAM940-SIM-NaI-P, which caters for users of a previous version of RIIDEye, called the SAM940.

**For more information, go to www.argonelectronics.com**

# Bristol Fashion

DMO
OVER TIME SOME THINGS DON'T CHANGE
1999
OTHERS DO FOR THE BETTER
2011
DEFENCE MATERIEL ORGANISATION
www.defence.gov.au/dmo
MO

BRISTOL UNIFORMS has supplied new firefighter kit for the Australian Defence Force (ADF) in the form of 1200 sets of Bristol's fire coats and trousers – a design similar to its Ergotech Action2 – for the army, air force and navy. Using an outer shell and thermal liner from Australian manufacturer, the Bruck Group, the outer shell uses its Melba Fortress 3G fabric with a thermal liner of Melba Insul-tex ProPlus quilted to Dupont Sontara. This is combined with a Goretex Fireblocker moisture barrier.

**For more information, go to www.bristoluniforms.com**

# Hainsworth Stays Ahead

It is 13 years since Hainsworth launched Titan, which helped to take firefighters' personal protective equipment to a new level. Titan, which formed part of the company's patented TI-technology, saw the emergence of garments with increased breathability for greater heat stress management, allowing firefighters to become more aware of the environment in which they were operating.

While the launch of Titan was an important milestone in the development of PPE, for Hainsworth it was simply the latest innovation in an association with firefighters stretching back more than 100 years. By the turn of the 21st century, Hainsworth was already established as a global leader in textile development, manufacture and application helping to protect firefighters around the world from the potentially devastating effects of heat and flame.

Since 2000, events such as the 9/11 attacks in the USA and the 2005 bombings in London have raised awareness of the demands placed on emergency services. Throughout this period, Hainsworth continued to listen to those on the frontline and innovate to ensure that the PPE they wear prepares them for all potential scenarios.

These innovations have included the introduction of Hainsworth Repel in 2002, the latest in finishing technology offering durable protection against hazardous chemicals without the need to re-impregnate after every wash. It provides first-line defence against chemicals that may be encountered by firefighters or riot police.

In 2004, Hainsworth Atlas was launched, offering the ultimate in heat and flame protection. Designed to be breathable, comfortable and minimise the effects of heat stress, it is robust enough to withstand the rigours of modern firefighting. Further innovation came in 2007 with the introduction of Hainsworth Metis, a 175gsm lightweight solution to be used in conjunction with quilted thermal barriers. Last year saw the company launch Eco-Dry, which offers a range of base-layer solutions incorporating the benefits of wool to provide firefighters with optimum protection and the highest levels of comfort.

Wool is a highly complex fibre offering a myriad of benefits, all from a renewable and sustainable source. It is naturally hygroscopic, meaning it can hold 33% of its weight in moisture before feeling damp and naturally regulates the absorption/evaporation of this moisture keeping a steady microclimate next to the skin, so the wearer feels cool, dry and comfortable.

Hainsworth innovation has sat alongside the many changes and updates to PPE standards affecting fire services over the past 25 years. Many were triggered by the King's Cross station tragedy in London in 1987 that cost 31 lives. This tragedy brought about a wholesale review of the PPE worn by firefighters in the UK who, until this time, were still arriving at emergencies wearing heavy woollen tunics.

With the publication of the EU Directive on PPE in 1989, the market in the EU was opened and harmonised and gave rise to the creation of European Standards. This led to the introduction of European Standard EN 469 "Protective Clothing for Firefighters" that enshrined in law the need for garments to undergo a number of tests to ensure they provided adequate protection against both radiant and convective heat. They must also meet the requirements for resistance against water penetration and tearing.

Standards have continued to be updated around the world and any innovation needs to reflect such changes. Every product developed by Hainsworth is subject to the most stringent testing in our own accredited laboratory and the design of fabrics is influenced hugely by the environment in which a firefighter operates and how the garments will be worn.

During recent months, we have looked closely at how our company, its technologies and products and the PPE industry have evolved over the past 40 years. As a result, we have created Hainsworth Technology under which sit three principal strands – Titan, Eco-Dry and Advantage. Titan is concerned with outer-shell systems; Eco-Dry is about the linings that sit next to the skin driving comfort and sweat management, while Advantage covers our many finishing technologies and product enhancements. Continuing to underpin everything are our core messages: that our protective fabrics deliver design that saves; protection that shows; and quality that lasts. APF

For more information, go to www.hainsworth.co.uk

# IWMA: Past, Present & Future

The early days of the International Water Mist Association (IWMA) were rather provisional and informal. However, there was a target.

Looking back, Dirk Sprakel, chief executive officer at the Cologne-based company Fogtec and current deputy chairman of the board, today puts it like this: "Against the background of the then developments, which had some of their roots in Eastern Germany – where the IWMA had its headquarters for many years – the founding members of the IWMA wanted to aim at bundling what was happening on an international level and communicate matters of common interest." These intentions led to the founding of the IWMA, which took place 15 years ago in April 1998.

The following two years were a phase of initiation during which the few – mainly German – members merely worked together on joint research projects and established a working group to collect existing guidelines for standardisation worldwide. Dirk Sprakel says: "The first two years were a time of casual exchange of thoughts and ideas, but as time went on our plans became more palpable."

In 2000, the IWMA became more international and in April of 2001 the first International Water Mist Conference (IWMC) was organised in co-operation with Factory Mutual Research, the Norwegian fire research laboratory SINTEF, the Swedish institute SP and the Finish institute VTT. Karl J. Sprakel, the first chairman of the board, welcomed more than 70 delegates from 20 countries to Vienna, Austria to exchange views and information. Among others, the purpose of this conference was to clarify that water mist is not only an auxiliary technology but a very sufficient method to extinguish fires, which is completely independent from traditional sprinkler systems.

Back then, water mist and the IWMA were met with scepticism and open opposition. Dirk Sprakel remarks: "At the beginning we were smirked at mainly because we were lateral entrants coming from water hydraulics and completely new to the firefighting industry, which we knew next to nothing about." Many things have changed since then due to natural learning processes, some important turning points and even to the odd moment of glory.

## Turning Points and Moments of Glory

The initial developments within Northern Europe – through UltraFog, Marioff, Semco and Novenco – had their effects on the firefighting market. In the late 1990s it was high time to establish an association that supported research, development and applications, brought together those who were active in that business and tackled one major problem: the establishment of international guidelines for the approval of water mist systems.

"Since then the IWMA has become the world leading forum for manufacturers, laboratories, classification institutions, academic institutions and users of water mist fire-fighting systems", says Ragnar Wighus, chief scientist at SINTEF and long-standing chairman of the IWMA-board. In order to reach that position there was work to be done and chances to be seized. In that respect a research project sponsored by the IWMA on "scaling of fire suppression characteristics in machinery spaces" carried out by SINTEF on behalf of the International Maritime Organization (IMO) was one of the great moments. The presentation of the outcomes in February 2009 was a key event for the Association. Another important milestone for the IWMA was the opportunity to support the European Committee for Standardisation, and to contribute to the CEN-guidelines. Also the National Fire Protection Association (NFPA) has asked the IWMA to hold seminars during its annual events, and so has relied on the expertise of the Association.

Most important though may be the fact that the largest part of the opposition has petered out and scepticism along with it. "Some of our opponents from the initial phase – even the very severe ones – are indeed involved in the water mist industry themselves these days. And some of them are even members of the IWMA", says Dirk Sprakel. **APF**

The 13th International Water Mist Conference will take place on 16th and 17th October 2013 in Paris, France.

For more information, go to www.iwma.net

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Lion Apparel has long been a name that is synonymous with the development and manufacture of highly functional, high quality protective work wear and specialised service and protective clothing. The acquisition of Lion International by the LHD Group in 2009 has allowed for further expansion and competencies in markets in Australia, New Zealand, Hong Kong, Taiwan, Saudi Arabia, Great Britain, France, Spain, Singapore and Germany. With garments custom-made to meet regulatory standards such as EN, NFPA or AS/NZ, and having the full support of a dedicated product development team, LHD Group is able to offer an extensive choice of options to develop garments as well as service solutions to meet individual specifications and needs.

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# Shaping Tomorrow

## The 2013 AFAC and Bushfire CRC Confer from 2nd to 5th September

*Euan Ferguson, Country Fire Authority Chief Officer and Chair of the Conference Steering Committee launched the conference program in April. Picture courtesy of Bushfire CRC*

Preparation for the joint Australasian Fire and Emergency Service Authorities Council (AFAC) and Bushfire CRC Conference is well underway – and it promises to be one of the best conferences yet.

The AFAC and BUSHFIRE CRC conference has been breaking records every year, and 2013 will be no exception. Over 1,400 delegates will come together in Melbourne from 2nd to 5th September to discuss the latest challenges and trends in emergency management. These delegates will come from state, federal and local governments, emergency services, industry, non-government organisations and research and education organisations from all over the world. The trade expo is expected to be the largest ever. In every way, it is the most substantial emergency management and public safety conference in Australasia.

This year's annual conference also marks a significant milestone for the industry, as it is both the 20th AFAC and 10th Bushfire CRC conference.

Launching the conference program in Melbourne in April, Country Fire Authority (CFA) Chief Officer and Chair of the Conference Steering Committee, Euan Ferguson, said the conference theme, *Shaping Tomorrow Together,* recognises the need for emergency services to work together collaboratively with the community and other partners from the education, health, business and research sectors, and all levels of government, to shape our future.

"I can assure you the program is of an extremely high calibre. In addition, this will be the biggest emergency management trade expo held in the southern hemisphere, with many businesses showcasing their products that help us protect the communities we serve. CFA, the Metropolitan Fire and Emergency Services Board, Parks Victoria, the Victoria State Emergency Service and the Department of Environment and Primary Industries look forward to hosting this milestone conference," said Mr Ferguson.

With national and international speakers presenting at over 90 sessions over four days, AFAC CEO Stuart Ellis said this year's conference was an opportunity for delegates to hear from speakers from different industries to contribute to the emergency management sectors understanding of how we can work together collaboratively to form partnerships.

"We have a number of high-calibre speakers confirmed for the conference program who will challenge and stretch delegate's thinking. The AFAC and Bushfire CRC conference is the most important knowledge sharing event in the emergency management annual calendar. Our key objective is to ensure that the collective industry knowledge and experience is captured and shared between peers," Mr Ellis said.

Leading international and Australian experts presenting include:

- Professor Tim Flannery – Chief Climate Commissioner, Australia.
- David Kaufman – Associate Administrator for Policy, Program Analysis, and International Affairs, Federal Emergency Management Agency, USA.

# Together

## ence is being held in Melbourne

- Professor Kate Auty – Commissioner for Environmental Sustainability, Victoria.
- Sam Johnson – Founder of the New Zealand Student Volunteer Army.
- Vij Randeniya – Chief Fire Officer, West Midlands Fire Service, UK.
- Dr Richard Gasaway – former Chief and founder of Situational Awareness Matters, USA.
- Andrew Demetriou – CEO, Australian Football League.
- Craig Lapsley – Fire Services Commissioner, Victoria.
- Neil Comrie – President, Metropolitan Fire and Emergency Services Board, Victoria.
- Professor John Alford – Professor of Public Sector Management at the Melbourne Business School, University of Melbourne and the Australia and New Zealand School of Government.
- Philip Stittleburg – Chief of the La Farge Fire Department, Wisconsin, USA

### Research Forum

Showcasing the latest in fire science from around Australia and the world, a highlight of the conference week is the Research Forum on Monday 2nd September.

Bushfire CRC CEO Gary Morgan believes the conference and Research Forum will show why research and innovation are more important now than ever. "Emphasising the diversity of the research being conducted across all hazards, the science on show at the Research Forum, as well as across the conference week, will highlight the significant work that the Bushfire CRC is delivering to emergency service agencies. The conference and Research Forum present a great opportunity for all emergency management practitioners to learn what we are discovering about the biggest challenges in emergency management across Australasia, and finding ways to use this knowledge every day to make our communities safer," Mr Morgan said.

The latest research into fire weather, community safety, smoke toxins and prescribed burning will be discussed, as well as a special discussion on the impacts of heat waves.

"The Forum is not just for scientists, but for all emergency management personnel and the wider researcher community. It is a must for anyone who wants to use new knowledge to make our communities safer," added Mr Morgan.

Leading international and Australian experts presenting include:

- Professor John Handmer – Centre for Risk and Community Safety, and Human Security Program, RMIT University and Principal Scientific Advisor and Project Leader, Bushfire CRC.
- Dr Stefan Hajkowicz – Principal Scientist, CSIRO.
- Ivan Pupulidy, Director, US Forest Service.

Featured presentations will also include Bushfire CRC project leader, Dr Jeff Kepert from the Bureau of Meteorology on extreme fire weather, the University of Western Australia's, Dr Illy McNeil, on how to identify underprepared residents in bushfire prone areas, and an outline of the research of the new Bushfire and Natural Hazards CRC.

Partnerships are one of the most important aspects of the Bushfire CRC, and the Research Forum provides a great opportunity to connect emergency management practitioners with researchers to discuss the latest fire science. As in years past, the conference will include the popular research poster display.

### Trade Exhibition

This year's trade exhibition is set to be the largest ever, covering over 6,000 square metres of the Melbourne Convention and Exhibition Centre. The trade exhibition is an opportunity for aligned organisations to gain maximum exposure to the lucrative emergency services market for their products and services. A number of high-exposure and unique sponsorship and exhibitor packages are available.

Following on from the success of the Sydney 2011 conference, a forum on Personal Protective Equipment (PPE) will be held on Monday 2 September. Featuring an international line-up of speakers providing the very latest information on PPE, the forum will include new innovation and trends for footwear and HazMat, as well as developments in relation to ISO, EN, NFPA Standards and how these relate to Australian Standards. In addition, there will be a comprehensive overview of the risk assessment carried out by CALFIRE for the move to new generation Wildland PPE.

Speakers include David Matthews, PPE advisor to the UK Home Office; Steve Hall, Goliath Footwear EU; David Mackie, Respirex EU; and Tom Foley, US Wildland PPE Project.

### Key Activities

- One-day, all hazards Research Forum: 2nd September.
- Two-day conference: 3rd and 4th September.
- Gala Dinner: 3rd September.
- Debate *"Is it only a disaster that brings us together?"* 4th September.
- Six Professional Development Workshops: 5th September.
- Four Field Study Tours from 1st September.
- Personal Protective Equipment (PPE) Forum: 2nd September.

For the full conference program, speaker list, a video about the conference and to register, visit www.afac2013.org. Early bird registrations close on 28th June. APF

For more information, go to www.afac2013.org

# Excelerate Drives Expansion with Ad Vehicles for Austr

*One of the two new mobile command vehicles developed for the State of Victoria Country Fire Authority by Excelerate Technology Group. They feature a full suite of integrated command communications solutions including mobile satellite broadband and DDMI. The vehicle specialist is Mills-Tui.*

Excelerate Technology Group is currently handing over and testing two new advanced command vehicles for the state of Victoria Country Fire Authority (CFA) as part of a major international contract in Australia.

Excelerate Technology Group, the UK-based emergency command communications provider, is currently working closely with staff at Victoria CFA in Australia integrating two new advanced mobile command vehicles into the Authority's communications infrastructure, and training staff for operations. The vehicles were procured following enquiries investigating the command communications issues that contributed to problems during the devastating 'Black Saturday' fires of 2009. But even before the vehicles were due to go 'on the run' after testing and integration they were drummed into action to provide emergency backup communications in late 2012, in an area where a fire had burnt out a terrestrial telephone exchange.

The catastrophic fires of Black Saturday in early 2009 placed massive stresses on the Victoria CFA's command communications infrastructure. This was hardly surprising given the speed, scale and intensity of the many huge fires that roared across the state that day. Following the disastrous loss of life, inquiries were conducted to understand what went wrong and what could be done to respond more effectively to future fires; from the normal seasonal bushfires regularly experienced by the state to exceptional events of the type such as Black Saturday.

One key need identified by these enquiries and the CFA was the requirement for a new type of mobile command vehicle to replace the existing 20-year-old vehicles that featured little more than a computer, radios and map tables. Another key area of concern was the need to reduce reliance on public communications networks, which were liable to collapse when burnt out by rapidly spreading fires.

In the process of searching for solutions to these challenges a team from Victoria attended the 2010 Interschutz international fire exhibition

# Asia Pacific
# vanced Command
# alia

*One of the two new Victoria CFA command vehicles parked in a local state fire station in late 2012. Locally-based Excelerate staff helped make the vehicles operational, providing the only means of communications for the surrounding area after a fire in a local telephone exchange wiped out all communications.*

in Germany, where they found what they were looking for – fully developed and tested command vehicles being demonstrated by Excelerate Technology Group, featuring mobile satellite broadband, wireless video and interoperable communications. CFA discovered it did not need to 'reinvent the wheel' for its new vehicles; the 'wheel' had already been invented, by Excelerate in the UK.

Considered to be some of the most advanced mobile command vehicles in the world, these vehicles are now being used extensively throughout the UK fire, police and ambulance services to improve communications resilience, real time information sharing and operational incident management.

'We had taken a HART (Hazardous Area Response Team) ambulance vehicle to Interschutz and we also took our own demonstration vehicle' said David Savage, founder and CEO of Excelerate Technology Group. 'The Australian visitors were absolutely bowled over by their capabilities. Consequently, we were invited to Australia to talk to them about how we could export our expertise and our capability into Australia. That is how it all began, and we are now being seen as part of the solution to their major challenges.'

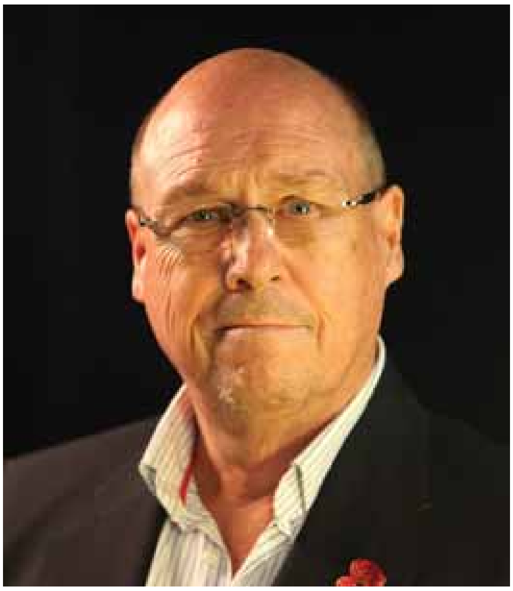
Excelerate Technology Group was selected to supply, integrate and support the communications solutions adopted by CFA, working in close partnership with Australian vehicle specialist Mills-Tui.

'In Australia, the catalyst for change was not terrorism, but the cataclysmic events of Black Saturday, where around 173 people lost their life in one day. This triggered an inquiry by a Royal Commission that identified a number of critical command communications issues for the emergency services. It found that the emergency services, just like in London after the London bombings, in that peak period of activity, were experiencing communications problems. They did not have enough technology and they relied on their public network far too heavily. This is a watchword with all emergency services the world over; if they are overly reliant on a public network then they are courting disaster. In all probability, they will one day get caught out and be found wanting,' he said

'In the UK now, fire service command vehicles have a comprehensive suite of data, voice and video applications that make satellite bandwidth truly compelling and very useful,' David said. 'Mobile satellite broadband has moved from being a nice-to-have to being a must-have, and anybody who is considering a new command vehicle in the UK these days absolutely has to have satellite broadband.'

'The Australians started by saying: "We are building new command vehicles and we want everything you have in the UK on those command vehicles". So, in addition to mobile satellite broadband they have a full suite of cameras, mast cameras, deployable cameras using the COFDM transmission standard, body-worn cameras and perimeter cameras, resilient communications, and things like private GSM. We are not simply bolting a satellite dish onto a vehicle.' The satellite being used gives full coverage of the continent of Australasia, including Tasmania, and New Zealand.

The vehicles will also utilise DDMI (Digital Dashboard Management Interface), an easy-to-use technology management solution developed by Excelerate. DDMI provides a clear interface for managing the wide range of technologies carried on vehicles, from deploying the satellite dish and weather monitoring to patching communications together from different devices, such as mobile phones and radios, via an interoperable intercom.



*David Savage, Founder and CEO of Excelerate Technology Group*

'DDMI is being seen as one of the best means for overcoming one of the biggest hurdles to introducing new and comprehensive technologies to people who are not IT experts,' David said. 'We have never lost sight of who our customers are – they are firefighters, paramedics and policemen. They are not meant to be re-trained to become IT specialists.'

'For Australia we are also developing things specifically for the client. That is another one of the things we do; physically investing in and developing new technologies on the back of requirements from our emergency services clients. This is only the beginning for DDMI. If it was a software product you would be calling it version 1. We do not see an end to this. The more ideas clients have, the more things they want to integrate, the more features will be integrated into DDMI. There will be many more good things for DDMI, and it will not just integrate things that we develop. It will also bring in things not supplied by us that clients have introduced.

**Mobile satellite broadband has moved from being a nice-to-have to being a must-have. If emergency services are overly reliant on a public network then they are courting disaster.**

The two vehicles were handed over to CFA in December 2012 and were not strictly scheduled to be operational until July this year. However, a fire in a telephone exchange in late 2012, that had a significant impact on terrestrial communications for about 250 kilometres, led to the deployment of one of the new command vehicles ahead of schedule. That vehicle actually became the only means of communication for anybody in that region, reinforcing the message about the importance of resilience and business continuity.

'The Victoria CFA chief requested us to supply one of our resident engineers to help support the deployment of one of their new command vehicles ahead of schedule That vehicle was actually parked front ways into the fire station in the affected town, with its rear end hanging out with its satellite dish deployed.

'These are the first vehicles of their type in Australia; they really are pioneering. Even in New Zealand, where there are vehicles that have a satellite dish on them, no one is using the level and types of capability the way our customers in the UK or CFA do,' David said. 'We will be head-quartering our Australasian business in Melbourne and supporting New Zealand clients from there. The trip by plane to NZ is almost a domestic flight.'

One person who has seen at first hand the unique benefits of the new vehicles is Craig Brownlie, Acting Manager Structural Planning, Victoria CFA, who is responsible for the introduction of the two new command vehicles.

'We needed to fix a specification for new vehicles, which we replace about every 20 years, which would be fit-for-purpose for the next 20 years. We did a lot of national and international research to ensure that we have better situational awareness for our incident management teams, delivering critical intelligence to the people who make decisions in a timely way, and in a way that is firefighter-friendly,' Craig said.

'When large fires spread they burn out the entire telecommunications infrastructure that is in place. This reduces our capacity to communicate at a critical time. We wanted to make sure that we have resilience built into our communications, for both data and voice, and this is why we selected the satellite option.'

'The vehicles will be used at Level 2 and Level 3 fires, working at divisional or ICC level depending on the type of incident. The vehicles are designed to be flexible for us. We do not pigeon-hole them to do only one job. We want them to be able to perform multiple roles, such as managing staging areas, with 100 to 200 vehicles and 2000 to 3000 people.'

'The first round of training has been completed. We have taken the vehicle out on a number of occasions for field-testing. It has done very well. We have been using the video facility such as the mast camera and the deployable cameras. We have also had the body-worn cameras out for field-testing with live video feeds back into the vehicle from 1.8 km, which is phenomenal. We think these vehicles are "cutting edge", and they are upgradeable. They have to be.'

'Excelerate has people on site and available in Australia 24/7, providing exceptional support for the commissioning of these vehicles. There has been support provided throughout the whole process – briefings, tenders and commissioning – which has been fantastic.'

'The interfaces that we use, the Excelerate technologies such as DDMI, are a real advantage from my perspective. With minimal training, or for people who have not been using the vehicle every day, they can push a few buttons and it performs as required. It is very simple to use. We have also had a few of our own special requirements that were not in the system, and Excelerate has been fantastic in integrating new features into DDMI for us.' APF

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# Conference Unveil
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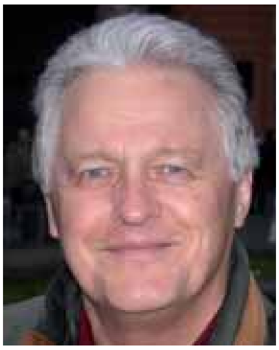

**Graham Collins**

Email: graham.collins@
mdmpublishing.com

If delegates attending the Australian & New Zealand Disaster and Emergency Management Conference in Brisbane in May were expecting to hear about the nuts-and-bolts of emergency management processes and procedures, they were in for something of a surprise. Instead, speaker after speaker addressed the "bigger picture", setting out a new paradigm for disaster and emergency management; one that is founded on building resilience, achieving teamwork and ensuring strong community involvement.

More than 340 delegates, representing just about every facet of disaster and emergency management, filled the Brisbane venue to capacity for the second two-day Australian & New Zealand Disaster and Emergency Management Conference. There, far from getting bogged down in endless operational and procedural detail, leading authorities presented them with a clear vision of how disaster and emergency management is going to change, develop and improve in Australia and New Zealand over the coming years.

Few attending needed any reminding of the increasing severity, variety and escalating frequency of the natural, man-made and man-assisted disasters that the world is now experiencing. In Australia, the Queensland floods in 2011 cost somewhere in the region of AUD$30 billion and 35 lives, while the Black Saturday bushfires in Victoria have been "conservatively" estimated to have cost in the region of AUD$4.4 billion and taken 173 lives. In New Zealand, the Christchurch earthquake killed 182 and racked up a bill of NZ$15 billion. Delegates heard that in the Asia Pacific region 480 million people live in earthquake zones, 200 million live in areas at risk from volcanic action, and 16 million are under constant threat of tsunamis and water surges. It is a staggering statistic that 87 percent of the world's disaster victims live in Asia.

Holding such an important conference in Australia does more than indicate Australia's and New Zealand's commitment to further improving emergency management skills; it is also a reflection of the fact that the two countries are recognised internationally for the skills that have been developed when facing such a wide catalogue of disasters, often at great frequency. As an example of this, one speaker reminded delegates that, for instance, at one time Victoria was dealing with bushfires in one part of the state while having to contend with flooding in another.

The conference is also a reflection of the undisputable fact that the world is experiencing an escalating number of high-cost disasters. Just citing

# s New Emergency digm

the North American experience, according to the USA's National Climatic Data Centre, in the 15 year period between 1980 and 1995 there were 46 disasters in the USA causing damages in excess of US$ one billion. Compare this with the 15 year period from 1995 to 2010 and the number of disasters in the USA in this category nearly doubled to 87. In monetary terms, the total loss in the 1980 to 1995 period was US$339 billion; the loss in the 1995 to 2010 was US$541 billion.

Matters have certainly not improved in the past couple of years. In 2011, the USA suffered no fewer than 14 disasters in the US$ one billion plus category, against the previous 15-year average of fewer than six. 2011 also experienced what is believed to have been the most costly disaster of all time; the World Bank reckons that the Japanese earthquake and tsunami in 2011 cost a staggering US$235 billion. It also resulted in nearly 20,000 people being killed and thousands more injured.

The conference heard that disasters and emergencies come in all shapes and sizes across the Asia Pacific region, spanning from natural events such as droughts, heat waves, pandemics, wildfires and bushfires, floods, cyclones, and tsunamis, to man-made disasters such as the recent clothing factory collapse in Bangladesh that took the lives of over 1100. The Fukushima nuclear disaster was a man-inspired event; the tsunami was certainly "natural" but the decision to ignore repeated requests by safety inspectors that the height of the sea wall should be raised is definitely not, nor was the locating of the diesel generators in a basement that was flooded within minutes.

This complexity and the human, economic, social, infrastructure, conservation, animal and livestock welfare and environmental impact of these events were addressed by many presenters, as was the inevitability of their occurring again.

There was no missing the fact that speaker after speaker emphasised the need to build communities' resilience to disasters and the conference had an equally strong focus on disaster risk reduction and post-event recovery as it did on response to the events. This raised any number of topics, from the application of appropriate building codes and standards, development policy and land use, to the need to adopt evidence-based solutions rather than being hidebound by outdated or narrow interest thinking and actions. One interesting figure to come out of these presentations was, research shows, that one dollar spent mitigating a disaster equals nine dollars recovering from it.

Many presenters covered the need for better coordination of effort and communication both "internally" between emergency response organisations and, increasingly, with the people caught up in the disaster or its aftermath. Many also highlighted the growing importance of social media – Facebook, Twitter and the like – which is enabling the faster and more accurate dissemination of information. Indeed, when discussing this particular topic, one presenter told delegates that on one particular day during a disaster his organisation issued five traditional press releases. This compares with them issuing information via Facebook every ten minutes.

The conference was split into keynote addresses, concurrent sessions and workshops. More than 70 speakers from across the world presented the latest thinking and research on a host of topics such as evacuation planning, initial responses to earthquakes, the use of GIS (Global Information Systems), emergency planning and preparedness, understanding community resilience and business continuity. Keynote presenters included: Grant Morrison, Director of Disaster Prevention and Risk Reduction at AusAid; Commissioner Ian Stewart, Queensland Police; Commissioner Craig Lapsley, Fire Services Commissioner of Victoria; and Scott Milne the Response Manager and Global Director of the International Association of Emergency Managers.

So what were the take-home messages from the conference?

First and foremost, disaster and emergency management is no longer just about red light and blue light activities; the future is about resilience. The need for emergency services to achieve interoperability – the ability to work together – is critically important, as is the need to involve everyone in the community, working together at the local level in partnership with the emergency services. If the new paradigm is to deliver it full potential, the open sharing of knowledge is also absolutely essential if better decisions are going to be made, as is improving our understanding of human behaviour, not just at the response stage but also in terms of preparedness and recovery operations. APF

**Both Australia and New Zealand are recognised internationally for the skills that have been developed when facing such a wide catalogue of natural disasters, often at great frequency, so the Conference examined what has been learnt from recent past events and took a close look at how to achieve greater resilience in the future.**

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# The Foam Labelling Issue

## Better Labelling Could Warn Firefighters Of Potential Hazards

**Mike Willson**

Willson Consulting

Surely everyone wants to respect and look after our environment. Protect it from harm, whether from development, destruction or pollution, wherever we are on the planet, but surely not at the expense of personnel safety?

Recent years have seen a major focus on environmental impact of firefighting foams particularly following the banning of PFOS (PerFluoroOctanyl Sulfonate) across the European Union (EU), once it was proven persistent, bioaccumulative and toxic (PBT). Disposal by high temperature incineration is now a legal requirement in all EU member States. PFOS is also listed on the Stockholm Convention's list of Persistent Organic Pollutants (POP) along with our worst pesticides like Dieldrin. Several other countries are following this lead, so thankfully PFOS is rapidly becoming a problem of the past.

PFOA is also being adequately addressed with the US Environmental Protection Agency's (EPA) voluntary Global Stewardship Program. This has two key objectives, to achieve a 95 percent reduction of already very small amounts of PFOA, its precursors and higher homologues, from both products and facility emissions by 2010, while striving for complete elimination of PFOA from emissions and products globally by 2015. In the EPA's annual progress reports for 2012, these manufacturers confirm >97.5 percent reductions achieved in their US facility emissions and >95 percent reductions from US fluorotelomer-based products. Overseas, all but two manufacturers achieved >88 percent in both facility emissions and product reductions, suggesting these objectives are achievable.

### Major Differences Exist Between Long Chain and Short Chain Fluorochemicals

It was recognised by several speakers at the recent 2013 Reebok International Foam Conference that there are significant differences between various long chain and short chain fluorochemical surfactants; they are not all alike, as some would suggest.

Modern fluorotelomer surfactants based on shorter chain C6 molecules, which have been used since the early 1970s in firefighting foam products, simply cannot degrade to the longer 8-chain PFOS or PFOA (PefluoroOctanoic Acid) molecules, but rather to 6:2 FTS (FluoroTelomer Sulfonate) and PFHxA (PerFluoroHexanoic Acid). Extensive fate and behaviour studies conducted by DuPont for the EPA have shown that these C6 fluorotelomer surfactant (C6FS)-based concentrates have replaced PFOS-based AFFFs (Aqueous film Forming Foam) with alternative AFFFs, FFFPs (Film Forming FluoroProtein) and their AR (Alcohol Resistant) versions, which cannot break down to PFOS, cannot break down to PFOA, have low toxicity to mammals and other aquatic organisms, are proven not to be developmental toxins, and are proven not to bioaccumulate in the environment, or concentrate up the food chain.

Further studies on the breakdown product of fluorotelomer surfactants (6:2FTS), have shown that it has not been found in human milk or liver samples, and shows clearance times from blood

plasma, liver and fat in rats of less than 100 days, which seems quite short. The C6FS breakdown product PFHxA has shown elimination half-life from rat's blood of around 0.2 days, monkey blood of one day and human blood of less than 28 days, compared to OECD (Organisation for Economic Co-operation and Development ) reports of a half-life elimination for PFOS of 100 days in rats, 200 days in monkeys, and several years in humans. It would be surprising if major concerns about long-term environmental persistence were still being levelled at such relatively fast C6FS clearance times from these short chain breakdown products, when there appears to be no evidence to suggest they may be harmful, in contrast to the very different behaviour of PFOS. Surely with such short-term clearance times from animals and seemingly no harmful environmental persistence effects being found, should this logically cease to be a major obstacle for environmental regulators?

### Is Environmental Labelling in Isolation Worthwhile?

The UK Civil Aviation Authority's Information Paper IP-04 "Aviation Firefighting Foam – Performance Testing and Environmental Impact", published in October 2012 focussed on a complex environmental labelling system and qualified products listing (QPL) which was overcomplicated, would be hard to translate into many different languages, and failed to give any consideration to fire performance labelling or important user safety issues. Yet the CAA has confirmed that fire performance is paramount, it's key criteria 1... and key criteria 2 is environmental impacts, so why not reflect this in their labelling proposals?

In the light of the problems faced by PFOS, at first glance their approach may seem worthwhile; although since the early 1970s there have always been equally effective far less hazardous alternative fluorinated chemicals than PFOS. PFOS has also been banned across the European Union (EU) since June 2011, with high temperature incineration above 1100°C being recommended. PFOS is also being targeted for restrictions on use and disposal across 30 countries in the OECD including Australia, Canada, but also Singapore and a growing number of other states across the globe. To a large extent we should consider this danger as now being controlled, so should we move on and properly assess the safer alternatives?

Fluorine Free Foam (F3) is being offered by some as the "environmental saviour" yet it still exhibits higher aquatic toxicity, persistent edge flickers, sudden flashbacks, concerning levels of fuel pick up – particularly during forceful application, which can lead to fuel being carried past oil separators into the environment as pollution incidents. This does not occur with leading alternative C6FS-based AFFFs and their Alcohol Resistant versions. FluoroProteins (FP), FFFPs and their AR versions with a natural protein base, would exhibit even less affinity for such fuel pick-up.

This information paper seems to ignore the potential environmental cost from inferior firefighting performance, often slower extinguishment and likely larger foam volumes required for a given sized fire, more soot particles that adversely impact on our changing climate, plus potentially increased risk to firefighters' safety. Should we not be considering the wider picture, and integrate environmental aspects with fire performance in a more holistic approach to a firefighting foam's overall social and environmental impacts?

### Why Not Integrate Environmental Impact With Fire Performance?

It is perhaps surprising that there is still so much focus on environmental hazard classifications, when F3 and C6FS-based products would seem relatively similar in environmental impact terms; almost a "level playing field" even?

Neither F3 nor the best C6 FS alternatives can be considered benign in significant fire emergency responses, where potentially large and uncontrolled quantities of either foam type could enter the environment. The Annexe VIII of the EU Water Framework Directive 2000/60/EU defines one of the 12 undesirable pollutant categories as: "Substances which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.)", which must include both Fluorotelomer surfactant-based and F3 products. The attempted inclusion of fluorotelomer surfactants as a pollutant under the sweeping category of "organohalogens" was a result of PFOS, a PBT organohalogen, also a highly mobile POP in the aquatic environment. Extensive research has since shown this undesirable behaviour is largely confined to PFOS, and does not apply to short chain C6FS based foam concentrates.

Both F3 and C6FS-based foam concentrates have relatively low aquatic toxicity, low bioaccumulation factors, with no bio-concentration up the food chain, while F3 is 100 percent biodegradeable and C6FS-based foam concentrates are >95 percent biodegradable, with the remaining persistent C6 fluorochemicals being excreted from rat organs and fat in around 3 months, and seemingly no evidence of any harm to humans or the wider environment.

Frustratingly there seems little focus on fire performance comparisons that seem significantly more marked and deserving of attention, yet little attempt has been made to integrate these two aspects – environmental impact and fire performance – into a single unified and more holistic product labelling scheme. Now that would be genuinely informative and useful for foam users the world over.

A recent Reebok presentation boldly tried to address this vexing issue by proposing an integration of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) with possible future computer modelling predictions and fire performance standards. Although many existing fire performance tests are only pass/fail criteria. Such an integrated labelling proposal has merit, but would require a gradation of fire performance ratings, perhaps more like those defined in EN1568, Part 3:2008 or the LASTFIRE test protocol. Both have built-in ratings, although the latter is a batch test only, and neither are perfect for this job. Historically each fire test has been designed to meet the needs of specific fire applications, so no "universal" test exists that could be representative and meaningful of any fire scenario. Perhaps this integrated labelling objective is an opportunity to develop one?

## Research Shows Wider Fire Performance Differences

Interestingly, data from the independently-witnessed F3 testing in Denmark last year gave unexpected results. Five leading F3 products were tested to the ICAO Level B fire test standard with a fixed nozzle position as required by the new proposed changes. All F3 products tested failed to get close to the current requirement for 60 seconds extinction time. The fastest F3 was reported to achieve fire extinction in 84 seconds, while three were within 20 seconds of the proposed new time limit of 120 seconds, and the slowest failed to extinguish inside 120 seconds. Perhaps these results are indicative of future performance under these proposed ICAO Level B changes?

This must give concern to existing F3 users, when foam quality generated from nozzles in practical use, often falls short of the UNI86 test nozzle performance. Could this further erode the margin of safety, and potentially expose firefighters to danger?

## Consistent F3 Failures with Forceful Application

All five leading F3 products delivered consistent but similarly disappointing performance on this ICAO fire test. Further testing was conducted during this same period in Denmark using these leading F3 concentrates, on the EN1568 Part 3 test protocol. Only three were able to gain acceptability to pass, two of them achieving IB ratings, indicative of acceptable performance when forcefully applied. However when the Modified Military Specification (MMS) nozzle was used (developed to better replicate normal ARFF and municipal nozzle performance with foam) at an identical flow rate and pressure to the UNI86 test nozzle, both products with the IB rating dropped to IIIB, still showing a margin of safety, but perhaps indicating these products may be better suited to gentle applications in practical use? The IIIB product failed the test with this MMS nozzle. In comparison one would reasonably expect C6FS technology based AFFF or FFFP foams to pass with IA/IB ratings, indicating acceptance and suitability for both forceful and gentle applications.

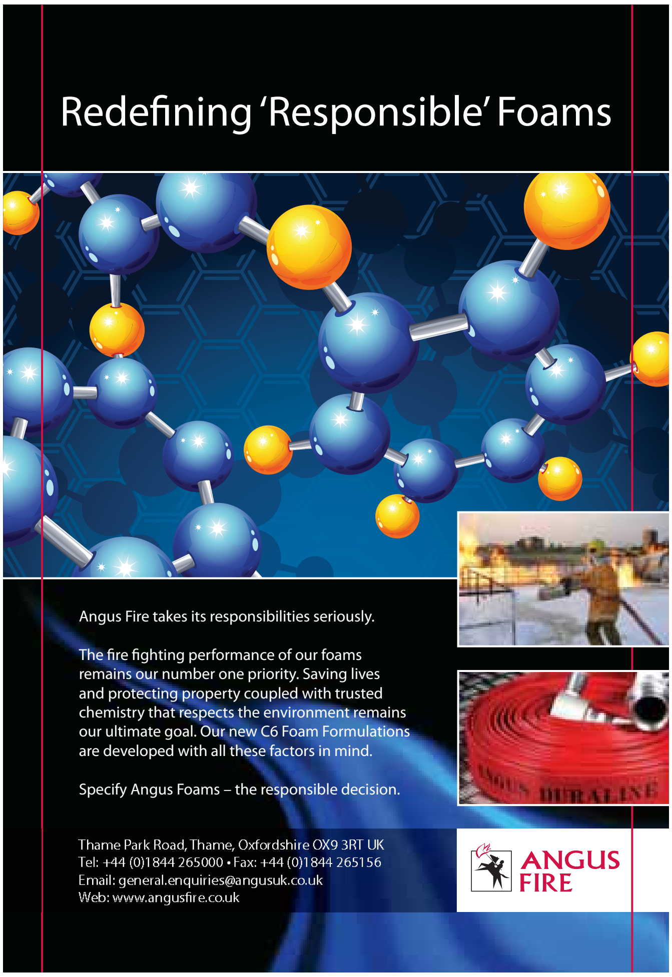
## Does F3 Fuel Contamination Identify the key?

A contributory factor in these disappointing Danish results may come from the forceful plunging effect of the foam during the fire test, which was the subject of recent foam flammability research explained at Reebok. During direct forceful application of foam into a flammable liquid fire, inevitably there is some turbulent mixing of the foam with the hydrocarbon based fuel. F3s generally contain high levels of synthetic detergents (hydrocarbon surfactants) to help compensate for other missing ingredients, yet these are unprotected but have a natural affinity for mixing with fuel. When used forcefully, the hydrocarbon surfactant foaming agents used in F3 foams attract the hydrocarbon fuel, mixing them together.

As a result some fuel is trapped within each F3 foam bubble, as it floats to the surface. All is well, until these bubbles start to collapse, releasing fuel vapour. This can remain above the foam layer, but if it finds an ignition source or incandescent materials nearby like smouldering tyres, plastics or fabrics perhaps, the fuel vapour may ignite, which can cause sudden flashbacks and re-involvement, often collapsing the remaining foam blanket. This raises concerns whether F3 foams should perhaps be restricted to use for gentle applications only in future? Why does such significant fuel pick-up not happen with AFFF or FFFP foams?

## Alternative C6 Fluorinated Foams are Different

The detergent in AFFF foam, after the same forceful mixing during these tests, resisted fuel pick-up and did not ignite. Fluorosurfactants being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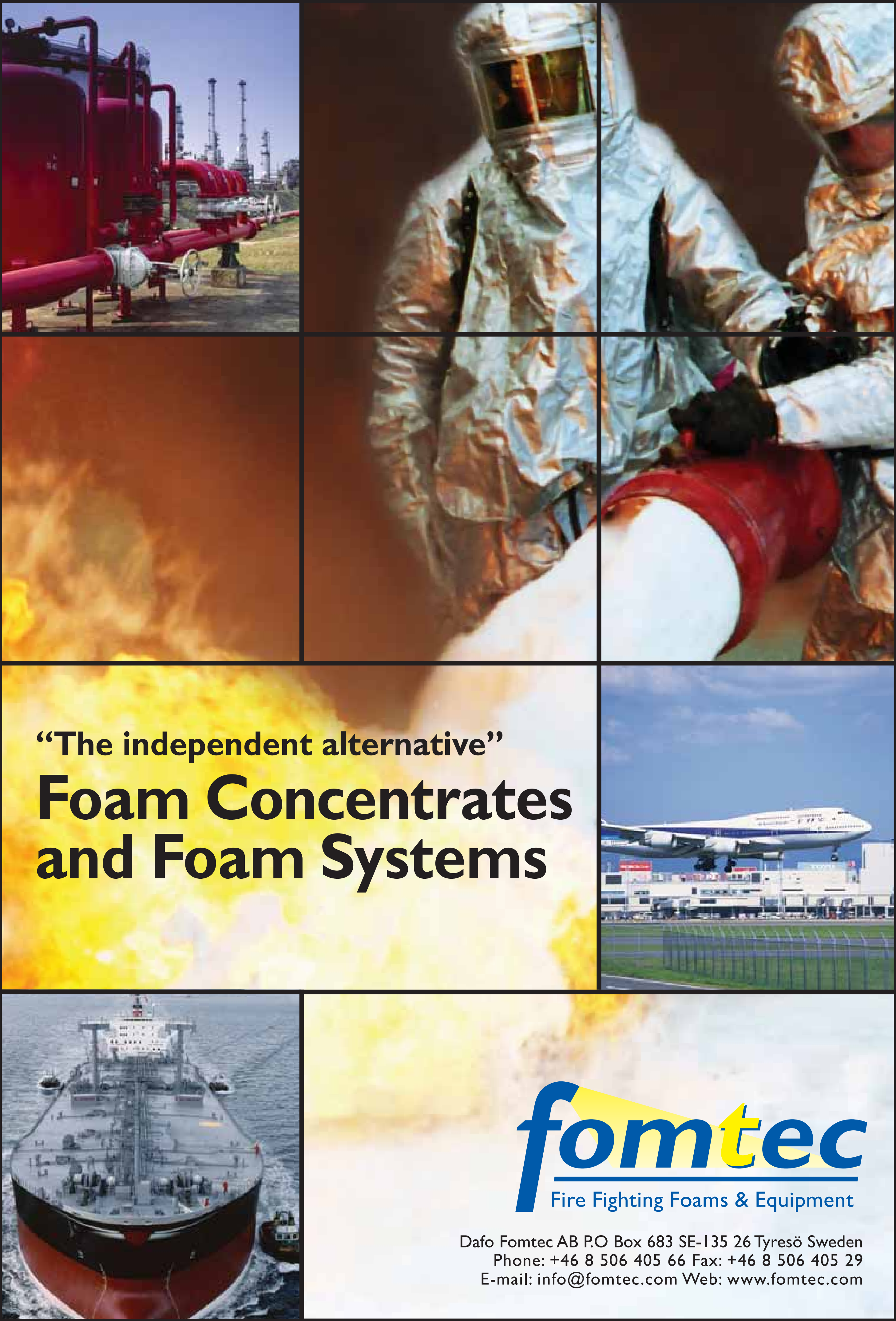

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oleophobic (oil hating) protect the foam bubbles from attracting so much fuel. Fluorosurfactant containing foams therefore do not get mixed readily with hydrocarbon fuels, helping to minimise any turbulent fuel pick-up. Consequently the foam does not burn or suddenly re-ignite after forceful application, as it is protected, so does not face the same problems.

Such significant tendency for fuel pick-up exhibited by F3 products could potentially lead to hydrocarbon fuels also being carried past fuel separators, into the local environment and drainage canals. This could lead to localised oxygen depletion and potential pollution incidents, which may even increase environmental risks.

Such by-passing of fuel separators does not seem to occur with fuel repellent C6 fluorotelomer surfactant based leading AFFFs, FFFPs and their AR alternatives.

## Conclusions

Recent flammability research and independently witnessed fire testing in Denmark seem to indicate that F3 foams may have limited suitability for forceful application on a wide range of hydrocarbon-based flammable liquids. F3 performance has been shown to struggle when tests using forceful application techniques are used like the ICAO level B fire test, particularly with a fixed position nozzle. In these Danish EN1568 Part 3 fire tests with the more representative MMS nozzle, it seems that gentle application may be more suited as an application method. This is not the case with film forming AFFF and FFFP foams even when forcefully applied. They have C6 fluorotelomer surfactants protecting the foam bubbles, so fuel pick-up is minimised and insufficient to create sudden flashbacks or rapid foam blanket degradation.

Rather than focus on a complex environmental labelling system as proposed by the UK CAA, would not a simpler integrated environmental impact and fire performance labelling system be more beneficial? Perhaps a more useful start could be the simplest warning label to consider some foams suited for "gentle tasks", like F3 perhaps, as the research suggests. Those suited for "hard tasks" demanding forceful application are more likely to be fluorotelomer surfactant protected film forming AFFF and FFFP foams that we have successfully relied upon to deliver firefighter safety for many years. This seems particularly relevant when leading film forming foams are now using environmentally responsible C6 fluorotelomer surfactants, which cannot breakdown to the harmful PFOS or PFOA of the past, have been shown through extensive fate and behaviour studies not to be developmental toxins, to have low toxicity to mammals and aquatic life, have low bioconcentration factors and not bio-accumulate up the food chain. Unlike C8 and longer chain fluorosurfactants, these short chain C6 fluorotelomer surfactants also exhibit quite a short elimination half-life from rats and humans. A far cry from the very long persistence times and mobility in the aquatic environment that we have seen from harmful PFOS. **APF**

**Mike Willson** is a firefighting foam specialist at Willson Consulting

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# Charting a New Course in Sustainable Fire Protection

Today, sustainable fire protection is all about minimising impacts on people, the planet . . . and the pocket-book. So, how do fire safety engineers in the Asia Pacific region avoid the pitfalls of the earlier Halon phase-out initiatives?

**Terry Goh**

3M

When talking about the sustainability of a particular technology, the discussion typically focuses on its environmental impact. Environmental concerns are certainly the driving force, but economic and social issues are also important considerations in addressing the sustainability of a given technology. Specific to clean agent fire suppression, the Asia Pacific market is currently experiencing the long-term economic cost of installing, maintaining, and ultimately disposing of Halon, which was phased out by the Montreal Protocol. As usual, environmental and economic sustainability are tightly linked.

Today, as fire protection professionals in the Asia Pacific region transition away from Halon, they have more environmentally responsible replacement options than their colleagues in the USA and Europe had two decades ago. This provides them the unique opportunity to "leapfrog" first-generation Halon replacements such as hydrofluorocarbons (HFCs). HFCs, following the path of Halon, are under increasing global policy and regulatory pressure in favour of alternatives with a much lower environmental impact.

In 1987, an international treaty known as the Montreal Protocol – or to give it its formal title: Montreal Protocol on Substances that Deplete the Ozone Layer – formalised the commitment of the world's industrialised nations to phase out the production of ozone-depleting substances, including Halons used in fire protection. HFCs, which have zero ozone depletion potential but are considered "greenhouse gases" because of their high global warming potential, were broadly

| | Atmospheric Lifetime (years) | Ozone Depletion Potential (ODP)[1] | Global Warming Potential – IPCC[2] |
|---|---|---|---|
| FK-5-1-12 | 0.014 (5 days) | 0 | 1 |
| HFC-125 | 29 | 0 | 3500 |
| HFC-227ea | 34.2 | 0 | 3220 |
| HFC-23 | 270 | 0 | 14800 |
| Inert gas | 0 | 0 | 0 |
| Water mist | N/A | 0 | 0 |

[1] World Meteorological Organization (WMO) 1998, Model-Derived Method.
[2] Intergovernmental Panel on Climate Change (IPCC) 2007 Method, 100 Year ITH, $CO_2$ = 1.

adopted as first-generation Halon alternatives in much of Europe and North America. As Halon production in "Article Five" countries ceased in 1993, the installed base of HFC clean agents grew quickly; consequently, so have HFC emissions.

HFCs are used in applications such as refrigeration, air conditioning and foam blowing, as well as for fire suppression. These gases have typically been thought to represent a small percentage of the overall greenhouse gas emissions. Nevertheless, as recently reported in the *Proceedings of the National Academy for Sciences* (a private, non-profit society of distinguished scholars, established in the USA by an Act of Congress), if nothing changes, HFC emissions are likely to amount to between nine and 19 percent of global $CO_2$ equivalent by 2050.

A basic tenet in the emissions scenario for all HFC applications is that a substantial majority of HFCs being manufactured today will ultimately be released into the atmosphere, whether in actual use, through accidental discharge, in transport or during eventual disposal. HFC concentrations that have been measured in the atmosphere reflect this reality.

Certainly, there are differences in emission scenarios for the various applications in which HFCs are used. However, because there are no reporting requirements for fire protection products such as HFC-227ea, the volume of emissions from fire suppression applications has not been easy to determine, and different means of evaluating these emissions yield dramatically different estimates.

A recent study of the atmospheric concentrations of HFC-227ea – the most common Halon alternative fire suppressant – revealed trends similar to HFCs sold into other sectors. That is, one would expect HFC-227ea emissions to continue to increase, year after year, as the installed base of systems expands. In fact, HFC fire suppressant emissions are not only growing, but this growth is accelerating. In addition, the HFCs used in fire protection have higher global warming potentials than those used in other applications.

### HFCs on the Regulatory Radar Screen

How does this measured increase in greenhouse gas emissions affect the long-term economic sustainability of HFC-based fire suppression systems? The fact is, HFCs have been subject to increasing scrutiny by policymakers and regulatory bodies worldwide, due to their high global warming potentials, their growing atmospheric concentrations and anticipated future growth. The question is, could this scrutiny ultimately lead to the kind of regulatory action that banned the production of Halons?

For example, on 7th November 2012, the European Commission (EC) submitted its much-anticipated proposal to replace the existing regulation on fluorinated greenhouse gases (F-gases). This new proposal has a twofold objective: to significantly reduce the emissions of these gases, both in the European Union and beyond; and to encourage the adoption of more climate-friendly alternatives.

This new proposal forms a part of the EU's efforts to reduce overall greenhouse gas emissions by between 80 percent and 95 percent by the year 2050, in comparison to 1990 levels. The European Commission's low carbon roadmap sets out a cost-efficient method to achieve this goal through contributions from all sectors and greenhouse gases. This includes fluorinated gases, the emissions of which have risen by 60 percent since 1990 (when HFCs began replacing Halons), even as all other greenhouse gas levels have decreased. This statistic echoes the premise mentioned earlier: with every installation of an HFC-based system, there will inevitably be a rise in HFC emissions.

The main new element of these proposed regulations is a cap and phase-down measure that, as of 2015, limits the total amount of HFCs that can be sold in the EU, with sales further reduced to one-fifth of today's levels by 2030. The established quota will be measured in $CO_2$ equivalent – meaning that producers of HFCs will need to make difficult decisions about how best to allocate their production among their various HFC products.

**As fire protection professionals in the Asia Pacific region transition away from Halon, they have more environmentally responsible replacement options than their colleagues in the USA and Europe had two decades ago. This provides them the unique opportunity to "leapfrog" first-generation Halon replacements.**

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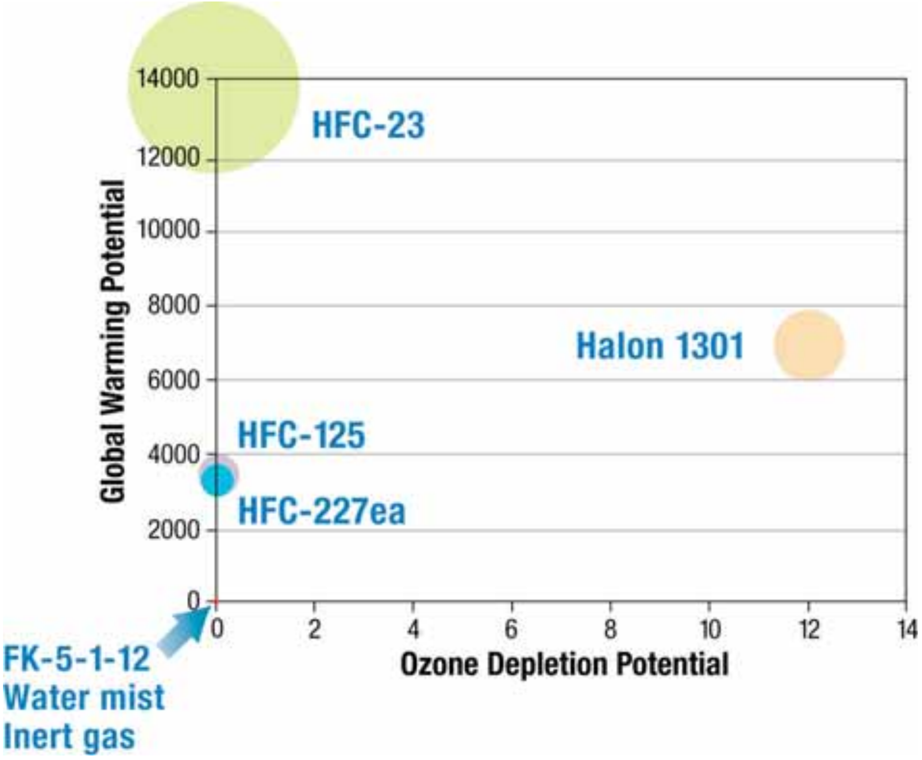
*Typical environmental properties of various Halon replacement technologies*



This framework does not favour HFCs in fire suppression, because these materials have higher global warming potentials than HFCs sold into larger sectors, such as foam blowing or refrigeration. For example, an HFC producer would consume the same percentage of a quota by making either one ton of HFC-227ea, or three tons of HFC-245fa or five tons of HFC-32. This dynamic brings further uncertainty to the long-term supply and cost of HFCs sold into fire suppression.

Nor is this EU proposal the only pending legislation relevant to HFCs. Similar phase-down proposals have been made under the Montreal Protocol, as HFCs are sold into the same sector as ozone-depleting substances. And in the Asia Pacific region, Australia in particular is taking action. Starting in July 2012, Australia implemented a carbon price as an incentive to use gases with lower global warming potentials. This initiative, part of Australia's Clean Energy Future Plan, is designed to drive down use of HFCs and other synthetic greenhouse gases. Initially priced at AUD$23 a ton of $CO_2$ equivalent, this amount will gradually increase until 2015, when the price will be determined by the market. HFCs – including those sold into fire suppression – will at that time face an equivalent carbon price magnified by their global warming potential. With the high GWPs of HFC-227ea and other HFC fire suppression agents, this translates to a carbon tax of up to 300 percent, which may prove an insurmountable additional expense for the fire protection sector.

## An Environmentally and Economically Sustainable Alternative

The effects of Australia's carbon tax and the constraints of European quotas may well be portents of the future – particularly as viable alternatives are already available for clean agent fire suppression. Next-generation clean agent FK-5-1-12, for example, offers an environmental profile superior to that of HFCs, while still delivering excellent extinguishing performance and a wide margin of human safety. Manufactured by 3M, FK-5-1-12 is an in-kind Halon replacement alternative to HFCs that has zero ozone depletion potential, a global warming potential of only one, and an atmospheric lifetime of a mere five days. This sustainable Halon alternative, branded as 3M Novec 1230 Fire Protection Fluid, can deliver up to a 99.9 percent reduction in greenhouse gas emissions relative to HFCs.

The existence of such alternative chemistries gives Asia Pacific countries a significant advantage. When Europe and North America began phasing out Halons 20 years ago, there were few options available; this has led to the rapid accumulation of HFCs in the atmosphere, and the corresponding regulatory turbulence today. Forward-thinking specifying engineers in the Asia Pacific region have a valuable opportunity to skip directly to third-generation technologies such as FK-5-1-12, avoiding the uncertainty that Europe and North America are experiencing with regard to the future of HFCs.

Growing HFC concentrations have clearly caught the attention of policymakers worldwide, and pending legislation is revealing the unsustainable path for HFCs in all sectors – including those sold into fire suppression. HFC emissions are accelerating, making them a target for regulatory action – and the fire protection sector is prepared with readily available, technically sound and cost-effective substitutes.

As was the case for Halon, when considering the likelihood of future regulatory restrictions, supply shortages and end-of-life considerations for HFCs, choosing a more sustainable chemistry is not only the most responsible course of action, it also makes sound economic sense – providing the best assurance that the fire protection system chosen today will still be viable decades from now. **APF**

**Terry Goh** is Marketing Specialist at 3M

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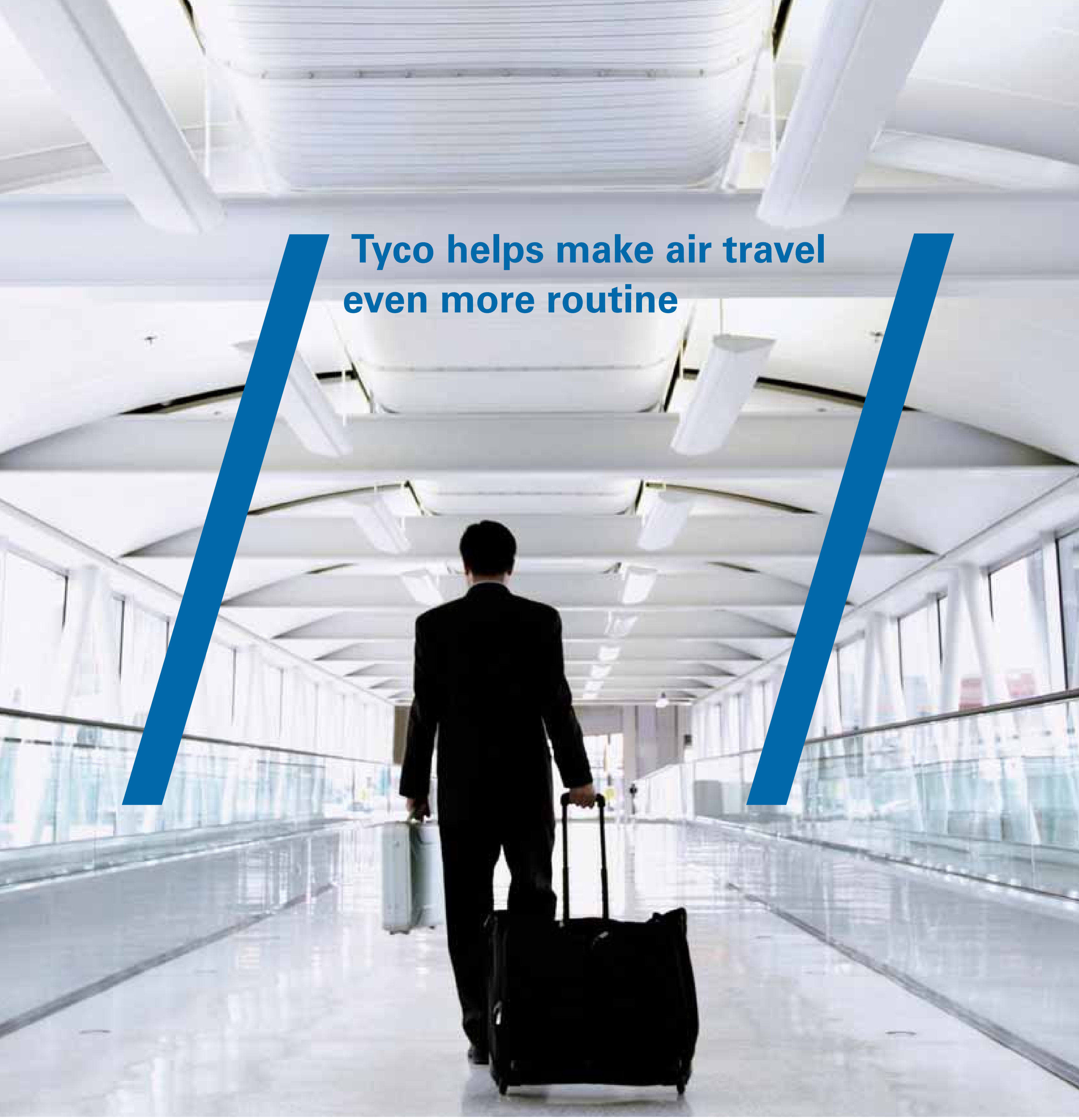
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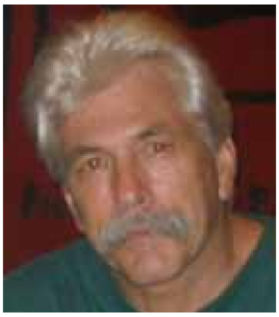
# ASD in Industrial and Harsh Environments: Part One



**Paul Leslie**

Xtralis

The correct application of fire detection in industrial applications is no less important than that of any commercial or residential application. The fundamental issue that seems to challenge many however, is that of the selection of equipment. What is the most appropriate fire detection equipment for the job? Communication is the key.

The development of fire detection products has come a long way over the past 25 years. In earlier times the choice of equipment was limited and somewhat basic in performance. Today the industry has a myriad of equipment available from which to choose. Equipment manufacturers inevitably come up with new ideas, introduce innovative techniques and develop specific equipment with the aim of satisfying new needs and capture greater percentages of the available market. The industrial market sector in particular however has always been one area where traditional detection equipment struggles with performance for a variety of reasons.

Technology or new equipment development brings with it certain questions, one in particular is: "what is the best technology or type of equipment available to serve the particular risk?" This is not an easy question to answer, since each application and environment is so individual, and each has its own idiosyncrasies and needs that lend it to specific types of equipment. As a result we are challenged with how to make the right choice. Determining the most suitable equipment puts pressure on those that are involved directly with the installation of fire detection systems, those that specify systems, cover risks, attend to system alarm call-outs and certainly the end user who lives with the life cycle cost of any system installed.

Cost too plays a very important role in system equipment selection. One could even be forgiven if, on occasion, we become lost in the "smoke cloud" surrounding equipment preference. Nevertheless, having an ever increasing number and choice of detectors available to us and with the wide variety of applications in which they can be installed, there is no doubt that in many applications equipment is being misapplied.

There are several reasons for this; often a limited

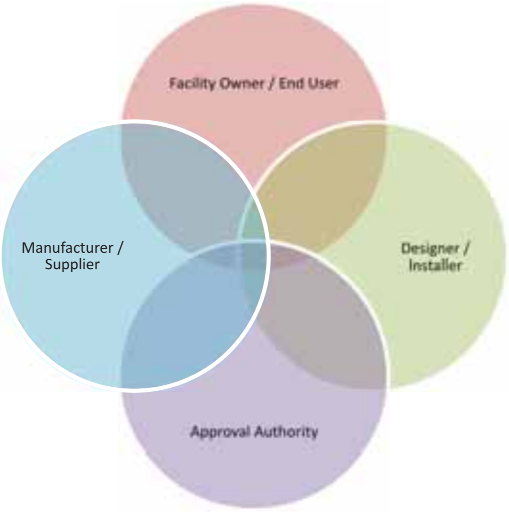


*Figure 1. Key stakeholder collaboration*

knowledge of the equipment and technology available, a lack of understanding of the application and environment, a lack of understanding of design around sustainable maintenance for the life of the equipment and certainly budgetary constraints. The need to simply win projects by installing the least expensive equipment is also a known industry concern.

The best outcomes are realised when the key stakeholders communicate openly and collaboratively to identify the variables that a detection system will be required to perform against. Figure 1 includes these key stakeholders, being the end user, the product developer, system designer and approval agency (where required).

Without this communication, the objectives of the system can be unclear to the different parties and the incorrect selection, installation and approval of an appropriate detection system to mitigate the known risk can have very negative and costly consequences.

This article focuses on key issues that should be considered in the selection of appropriate detection systems and provides some useful processes for evaluating the available detection options in the industrial market sector. Any of the suggestions provided here though are only as successful as the communication between key stakeholders to consider them.

## The Industrial Market Sector

The term “industrial” generally refers to that market sector involved primarily with manufacturing, processing and other similar operations.

Industrial applications present many challenges for effective and reliable fire detection. Not only does the fire detection system need to detect fires at the earliest possible stage it must also be able to withstand the various environmental conditions without generating nuisance alarms.

Conditions can vary from mildly contaminated to that of high background pollution. While many of the cleaner areas, for example, control rooms, switch rooms, and the like can be easily catered for by the use of ‘standard’ forms of smoke detection, there are areas that require careful thought with regard to the selection of equipment. In high background pollution environments or where constant dust exists, or even where smoke and fumes need to be tolerated as part of “normal” operation, the challenges in applying effective fire detection in these situations becomes even more difficult.

Equipment must perform when dust, dirt, and high levels of background pollution exist, contend with varying airflow conditions and finally offer the best possible benefits for the total cost of ownership over the life of the detector.

## Site Characteristic & Fire System Objectives

Industrial site characteristics are generally wide and varied. Large fuel loads, high temperatures, toxic, flammable and/or corrosive gases and liquids, wash downs, variable air movement, high ceilings … the list goes on; significantly different to the commercial office or shopping centre. Many sites can be slow to evacuate creating a real need for the earliest fire detection notification possible.

The fire protection objectives may vary but are also no less important than those in the commercial world, generally set down by insurers, owners and site managers applicable to the individual site and risks. These for example may include:

- Minimise the potential for fires and explosions through an effective fire prevention plan.
- Provide an effective means of limiting the size and consequence of fire incidents through early detection, effective emergency equipment and procedures.
- Avoid high insurance deductibles.
- Lower insurance premiums.
- Ensure compliance with local codes and standards.
- Provide ease of maintenance at minimal cost.

The fire risks may not be significantly different to those in other market sectors either. There are still electrical equipment faults, ignition risks due to external factors, lighting faults, bad housekeeping and human factor risks; all can contribute to real losses. Of course there are specific risks that exist, such as mechanical equipment faults, overheating due to excessive friction or equipment malfunction, open flames and hot surfaces and process upset. Regardless of whatever fire risk exits, these must be carefully assessed and the appropriate fire detection equipment selected.

The overwhelming challenge relating to fire detection equipment however is that of its ability to withstand the conditions of the application for its life expectancy, which must include a cost consideration for maintenance.

## Detection Challenges

The environmental conditions that exist in industrial facilities can present huge challenges. High levels of dust and dirt can cause malfunctions and nuisance alarms, smoke dilution in large volumetric enclosures influenced by air movement and stratification make it difficult to detect the early signs of fire. Normally-occurring background levels of smoke cannot easily be distinguished from real fire conditions and un-heated or un-cooled spaces cause temperature extremes outside of the operating range of some smoke detectors. Onsite activities such as wash downs can damage or destroy smoke detectors. In all, the many challenges a detector must face in these facilities limits the type available and their suitability to withstand these challenges.

The correct equipment selection is the first step in ensuring a fit for purpose solution.

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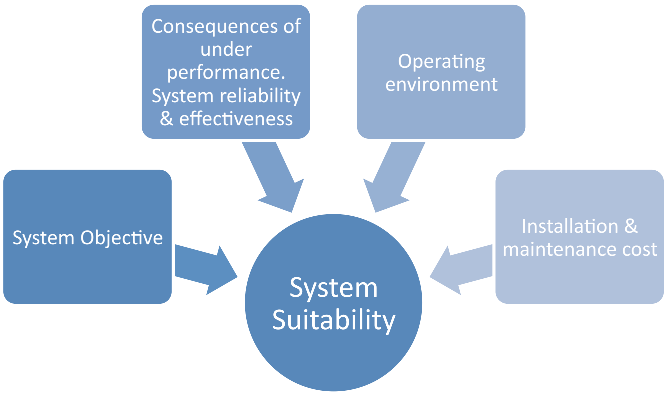
Consequences of under performance. System reliability & effectiveness
Operating environment
System Objective
Installation & maintenance cost
System Suitability

*Figure 2. System suitability*

## Selecting the Most Appropriate Fire Detection

Although regulatory requirements typically stipulate where and when fire detection should be installed, ultimately the choice of detection equipment is left those who quote and are involved in the installation process. The question is: "what are the criteria for selection"?

Figure 2 outlines some of the key points to consider in order determine system suitability and the appropriate fire detection product for the job.

In relation to individual product choice, many manufactures claim their equipment is up to the task. So how then do we prioritise our choice?

Perhaps the first step is to conduct a simple evaluation? The two key points that should not be over looked and essentially form the basis for the selection of appropriate equipment, are the consequence of loss to fire and the cleanliness of the environment in which the detection equipment is to operate.

The consequence of loss to fire can equate to how well the detection system can detect a fire, that is, if the sensitivity is poor then the risk and loss will increase. In terms of the cleanliness of the environment to be protected, if the equipment chosen is unable to cope with the conditions (environment cleanliness) and operate with minimal service and maintenance then it can be deemed inappropriate for the risk.

In addition, there is the aspect of longevity. What is the likely life cycle of the product? The more difficult the environment the more robust the equipment must be. Also, the harsher the environment the more intelligent the fire detection system must be. And do not overlook the ability to maintain the system in terms of access and cost.

To best illustrate this we can look at a simple selection matrix that has been developed and can aid in the evaluation. The chart (Figure 3, page 50) has been termed the "2 x 2 Fire Detection Selection Matrix". It provides a basic concept in which to view the selection of fire detection equipment for a number of market sectors and environments.

The "X" axis considers the environment, "Clean to Dirty"; the "Y" axis depicts the "Fire Risk" from low to high with consideration to detector sensitivity. There are four quadrants that represent the main fire market sectors.

The following is a brief explanation of each quadrant:

- **Quadrant 1: Generic**

The Generic Solution or Quadrant 1 can be defined as the sector where the fire industry conducts the bulk of its business, that is, the cleaner environments that are more or less considered low risk.

Typical applications include residential, commercial applications, office blocks, health care facilities, shopping centres and the like. The fire industry in general services this sector very well. Structures and applications are assessed and detection systems installed in line with codes and standards.

A variety of equipment is available from manufacturers to service this particular sector, for example, point detectors of various types, thermal detectors and beam detectors. Aspirating Smoke Detection (ASD) systems are very capable of addressing this segment and have indeed been used, although point detectors (addressable) are the most popular choice. Cost is certainly a significant factor here since compliance to minimum codes and standards is all that is required for the client. Fire contractors make their bread and butter from this sector which is very competitive.

- **Quadrant 2: High Risk**

The second quadrant the "High Risk" is the area that represents those clean environments but with high risk. Failure to respond at the early stages of a fire in these risks threatens business continuity and/or life safety. These high risk applications require suitable high capability detection with sound performance where any fire incident experienced could incur huge losses.

Depending on the application, specialist fire consultants and contractors and, in some cases, insurance will assess the risk and determine how the application is to be protected. Minimum requirements here are often above those suggested by codes and standards and 'performance based' solutions are often considered in larger facilities. Applications comprise mainly telecommunications facilities, computer and data centre facilities, semi-conductor and clean rooms and so on. Many electrical switch/substations and control rooms also fall into this category. It is also not uncommon for large open spaces and warehouses where critical equipment

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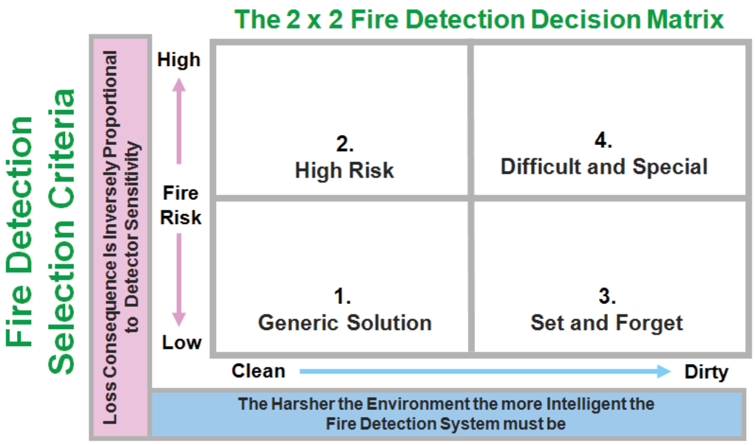
*Figure 3. 2 x 2 Fire detection decision matrix*


The 2 x 2 Fire Detection Decision Matrix
Fire Detection Selection Criteria
Loss Consequence is Inversely Proportional to Detector Sensitivity
High
Fire Risk
Low
2. High Risk
4. Difficult and Special
1. Generic Solution
3. Set and Forget
Clean
Dirty
The Harsher the Environment the more Intelligent the Fire Detection System must be

or goods are stored to be considered in this quadrant.

While point detection is certainly installed in these facilities ASD is still the chosen detection solution frequently used in these high risk high sensitivity areas and where very early warning detection is paramount.

- **Quadrant 3: Set and Forget**

The term "Set and Forget" has been used here since equipment often deemed appropriate for the application by manufacturers is installed with the confidence and the impression that it will perform with minimal issues and maintenance … in essence, install it and forget it.

This solution sits in the low risk/dirty quadrant, typically the industrial sector where the challenge in these types of environments is to select a product that will provide a level of fire detection without false alarm activity. The effort expended at the concept and design stage ensures the effectiveness of the detection system.

Unfortunately, the fire industry often places too much reliance on the products used in Quadrant 3 without understanding the environmental challenges. Owners and developers may even take a 'let it burn' approach to these sites. They just want to get everybody out and pass the responsibility to the fire services and their insurers.

A wide and diverse range of industrial applications and environments can fit within this sector and this tends to be where many of the issues occur. Products considered for this sector include thermal detection, CO, beams, linear heat cable and ASD; even specially designed detectors such as multi-criteria or multi-sensors have been developed to specifically try and minimise nuisance alarms. However, since industrial working environments can be very hostile the conditions can render many of these forms of detection ineffective.

On the other hand, and contrary to the belief of many in the fire industry, a realistic and viable option for smoke detection in hostile environments is ASD. A system can be specifically engineered and designed for the application and environment with an appropriate on-going maintenance plan that can perform as intended.

- **Quadrant 4: Difficult and Special**

Perhaps the most involved sector of all in this matrix is the "Difficult and Special". The solutions in this sector are purely industrial and must be considered in line with the risk present and the environment to be protected. Any high value processes/assets contained within industries require special attention. Examples can include:

- Dusty/Dirty – flour mills, grain silos, fertiliser plants, mining, potentially explosive environments.
- Freezer/Cold rooms – damp areas – food processing.
- Corrosive – processing wash-down, battery manufacturing, chemical storage and processing.

The solution in most situations is not cheap to implement, will likely require some system engineering and will come with a maintenance requirement needed to ensure continued operation. Specifiers and end users in this segment usually educate themselves well with regard to the options available before making a decision. Once again ASD has been used quite successfully in this sector.

## Matrix Summary

As previously suggested, all too frequently we see detection equipment suitable for the "Generic Solution" being misapplied and used, for one reason or another, in the other 'quadrants'. The equipment selected is installed without due thought to the application or environment or the costs associated with maintenance. Communication between the key stakeholders expressed in Figure 1 can help to avoid this misapplication.

Nevertheless, regardless of the type of detection chosen, the two key factors that should not be ignored are the consequences of loss to fire and the cleanliness of the environment to be protected. If these two factors are not considered then:

- A "Generic Solution" into "Set and Forget" results in poor detection and continued nuisance alarms.
- A "Generic Solution" into "High Sensitivity" exposes the client to increased loss through delayed detection.
- A "Set and Forget" into "High Sensitivity" results in high exposure to loss.

The "Difficult and Special" usually does not go too far wrong as the client, engineer or plant manager has a high level of involvement in the solution.

The matrix is offered as a simple means of proving some food for thought in terms of detection equipment selection and is by no means a total answer to evaluating all applications. Nonetheless, having consideration to the industrial market sector and conditions, aspirating smoke detection is a very real option and a well designed and engineered system using purpose built equipment will certainly offer a solution.

With this in mind, the next step would be to become familiar with the site, risk application and environment with the view to installing and ASD system. In the next issue of *Asia Pacific Fire*, I plan to provide some advice with regard to the installation of ASD systems in industrial applications. **APF**

**Paul Leslie** is Special Practices manager at Xtralis

For further information, go to www.xtralis.com

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**Graham Collins**

# What's new from Head to Toe?

Boots, gloves and helmets continue to attract a great deal of attention as manufactures continue to develop ever more efficient and safe solutions to these essential components of personal protection equipment. So, what is new on the market?

## Optimum Protection Helmet

DRAEGER's new HPS (Head Protection System) 7000 is described as a multi-functional solution designed to protect firefighters in any situation. Despite its low weight of less than 1.4 kg (in the basic version), the HPS 7000 is being heralded as one of the safest full-shell helmets in its class in accordance to EN443:2008 and EN14458:2004.

The outer shell is made of a composite material that, in combination with the PUR inner shell, provides reliable protection against thermal and mechanical impacts, and is able to withstand the enormous radiation heat and flame engulfment of a flashover. Made of high temperature-resistant polyethersulfone, the visor reliably protects eyes and face from high heat, particles, and liquid chemicals. An optionally available light-weight LED lamp is integrated into the centre part of the helmet shell, providing balance and illumination to the wearer in the work area.

The HPS 7000 is available in two sizes for head circumferences from 500mm to 660mm, and the ergonomic helmet design evenly distributes the weight across the head and so relieves the neck muscles. Users also have several easy adjustment options to make sure the helmet fits securely regardless of head shape. An additional option consists of integrated and individually adjustable eye protection. Both versions provide enough room for prescription glasses. An extensive accessories package is available to further adapt the helmet to individual needs and requirements.

The helmet is easy and efficient to service due to the minimum number of components. The entire interior fitting can be removed and reinstalled in just a few steps. Individual components can be replaced easily and quickly using standard tools. All helmet components can be cleaned and disinfected manually or in an industrial washing machine. A chemical protection suit (CPS) lever built into the helmet shell enables the face visor to be fixed when used together with a chemical protection suit.

The HPS 7000 is optimised for use with the Draeger FPS 7000 full face mask. The individually adjustable mask adaptation system of the HPS 7000 creates a safe mask-helmet combination with high wearing comfort. It is available in a variety of colours and an individual organization's emblem can be incorporated on the front plate.

**For more information, go to www.draeger.com**

## USAR & Technical Rescue Glove

ESKA is promoting its Crosstech gloves as raising the bar on rescue and technical gloves to a whole new level. As well as complying with EN 388, these gloves have been tested and certified in accordance with EN 407 for resistance to contact heat and to splashes of molten metal.

Highlighting the glove's hardwearing lasting protection and excellent level of comfort and dexterity, they are designed and manufactured to withstand just about anything rescuers might have to tackle. This includes rescuing casualties; recovering vehicles after an accident; rescuing animals and protecting the public from dangerous animals; providing assistance during floods and other kinds of extreme weather; removing spilled oil; handling dangerous goods; and sealing, removing and securing hazardous materials.

The ultra-thin, extremely robust Crosstech membrane insert is fully bonded to the glove's inner lining and outer shell. This provides the wearer with much better dexterity and grip, stops the layers slipping around inside the glove, and – a key factor for all rescuers – makes it easier to get the gloves on and off.

They provide a permanent, reliable barrier against blood and bodily fluids that rescuers could come into contact with during technical rescues involving, for example, patients with hepatitis or HIV. The gloves are also resistance to penetration by liquid chemicals and remain waterproofing even after several soakings/washing cycles. Breathable fabric allows moisture to escape and flexible, welded seams ensure an extremely comfortable fit.

**For more information, go to www.eska.at**

# Integrated Helmet

HELMET INTEGRATED SYSTEMS' helmet systems, combined with face shields, visors, respiratory and communications equipment, offer firefighters and emergency services personnel head, eye, face and respiratory protection.

The company's Cromwell firefighter helmets are promoted as being built to the highest quality, without compromise on wearer comfort or long term affordability, suitable for traditional structural and wildland firefighting applications, road traffic accidents (RTAs) and other non-structural firefighting duties.

Designed to comply with international standards and with a multi-adjustable headband and retractable visor, the Cromwell ER1 rescue helmet is designed for urban search and rescue (USAR) operations. The Cromwell Echo, originally designed as a submarine fire helmet, is ideal for use in confined spaces. It has an integral, cordless radio allowing multi-way communications between the incident controller, team leaders and individual firefighters and overcomes the communication problems associated with traditional radio systems when fighting fires in confined spaces.

**For more information, go to www.helmets.co.uk**

# Multi-Purpose Boot

ROSENBAUER has launched its new Twister-cross, a short boot with a Class C shaft that is suitable for all firefighting and rescue operations and has EN 15090:2012 F2A HI3 CI AN SRA certification instead of the 280mm shaft length stipulated in Austria by ÖBFV-RL KS – 06.

It offers enhanced wearer comfort due to special cushioning and two flex zones made from soft, grained leather. In spite of a height of only 190mm, the Twister-cross complies with the highest class of fire service operational safety and, as one of the few available short boots, is also suitable for indoor attacks. Ankle protection, steel inserts and toecaps protect the foot against injury. In addition, reflective elements ensure maximum visibility even when over-trousers are worn.

The Twister-cross is optionally available with a membrane. The Sympatex membrane and hydrophobic leather mean that the TWISTER-cross is largely waterproof and offers optimum protection against viruses, bacteria and liquids. The multilayer sole with air cushioning between the layers provides excellent insulation against cold and heat. The boot has a very low weight of approximately 2.2 kilogrammes.

The boot is also fitted with the innovative BOA lacing system. This utilises break-resistant, coated, stainless steel laces and a push/turn knob that enables the boot to be pulled on or off in a flash, as well as providing a perfect fit.

**For more information, go to www.rosenbauer.com**

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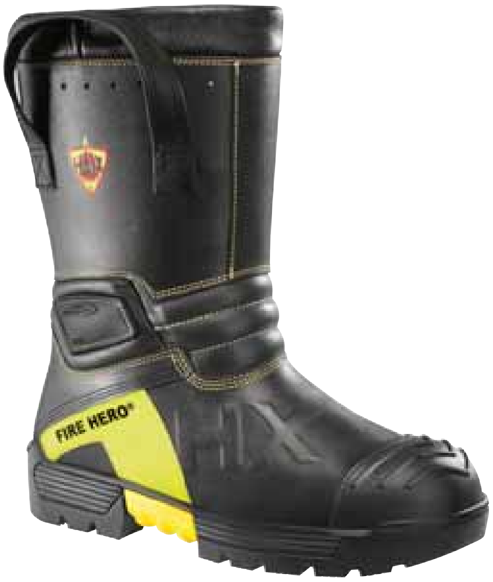
# Slip-on Boot



HAIX has unveiled what it is heralding as: "The ingenious slip-on version of the champion among firefighter boots", its Fire Hero Vario boot that features the special Ankle Flex System for an excellent fit without cumbersome lacing, where flexible stretch inserts ensure easy and fast putting on and taking off. The integrated bending zones along the upper instep and above the heel are said to give the Fire Hero slip-on model extra flexibility when moving the foot forward and backward, or even when kneeling.

Under the hydrophobised, breathable leather uppers, there is a Crosstech Laminate Technology lining. This lining is watertight, so that blood and other bodily fluids cannot penetrate it, keeping viruses and bacteria away from the body and providing improved protection against chemicals.

The wear-resistant lining material provides optimised comfort in hot and cold weather, which is of particular importance to people who work both outdoors and indoors. The Sun Reflect uppers reflect the sunlight, reducing the heating effect on the boot. The extra lightweight Carbon HX front cap guarantees excellent protection of the toes. The boot's anatomically-shaped insoles have good moisture absorption properties for extra comfort. They can be easily replaced and washed as necessary.

The boot comes with a foamed, abrasion-resistant rubber shell sole with many advanced features. The tread has been specially designed for optimum grip on smooth surfaces, ice, in snow and in water. The non-marking outer sole ensures excellent resistance to high temperatures, great toe-to-heel support, ladder rung tread pattern, outstanding thermal insulation, and resistance to oil and petrol. Ankle protectors and reflective strips provide extra safety. The profiled rubber toe caps protect the boot against wear, while putting on the boot is made easy by the large and strong side straps.

**For more information, go to www.haix.com**

# New Hood Offering

## Complements Growing Range of Fire Coats and Trousers

BRISTOL UNIFORMS has launched its own in-house designed-and-manufactured fire hood range in what the company describes as: "a move to provide customers with bespoke PPE products to complement Bristol's growing range of fire coats and trousers". The new fire hood is available in two styles and colours.

The Bristol Fire Hood 1 is a two-layer construction using a PBI Gold Rib outer with an Aramid Viscose inner layer. The Bristol Fire Hood 2 is black and incorporates a double layer carbonised fibre/para aramid blend. Both new products are designed and manufactured to BS EN13911:2004.

Both products are described as: "superbly comfortable, providing improved fit in garments that are both breathable and wickable". Among the benefits claimed for the new fire hoods are that they are easy to put on and take off, and provide increased coverage to the shoulder area to reduce the risk of 'roll up' around the neck and when worn with a breathing apparatus mask. The flexibility of the fabrics used ensures full security in operational situations.

**For more information, go to www.bristoluniforms.com**

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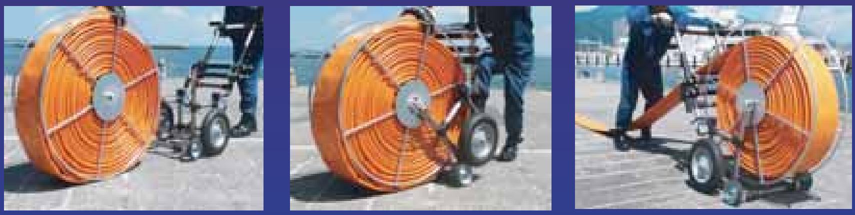

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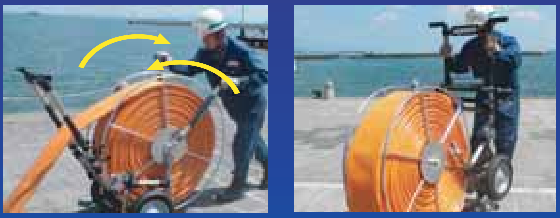

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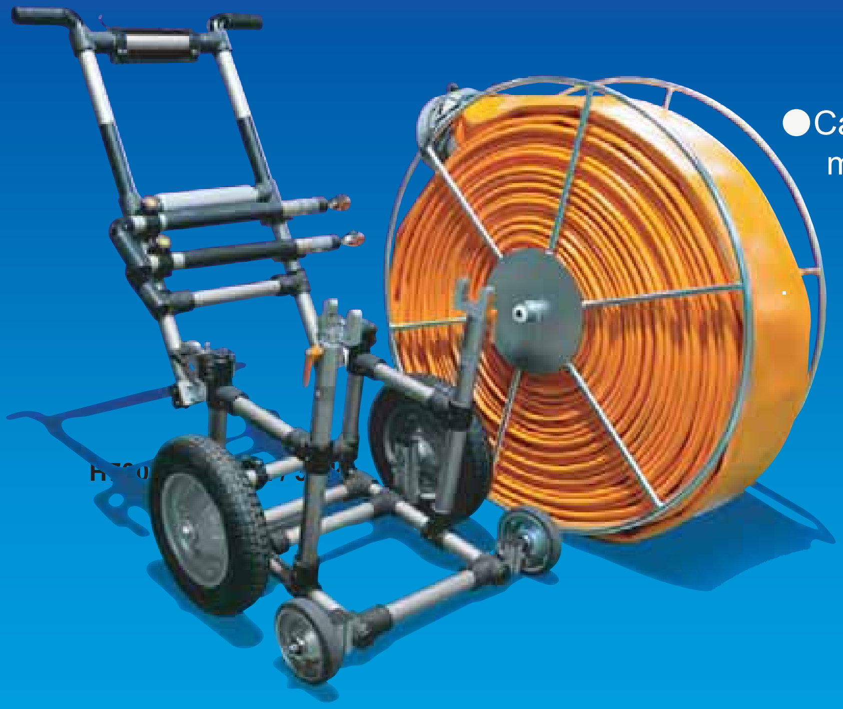

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| LH-200 | 150-250 | 30m |
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# Learning from the Christchurch Earthquake

**Rob Somer**

Process Evolution

**Paul Woods**

Fire and Life Safety Services

While many will recall the earthquakes that struck Christchurch, New Zealand in September 2010 and February 2011, perhaps few will appreciate that, as well as dealing with the immediate needs of the community, the fire service was itself a 'victim' of the earthquake. In addition to the loss of life in Christchurch itself, the earthquake caused widespread and significant damage to property and infrastructure, including structural damage to two fire stations, giving rise to the construction of temporary stations and facilities to support operations during the recovery phase.

A combination of significant property and population relocation, combined with the requirement to consider its own re-building needs, led the Fire Service Commission to identify in its 2010/11 Annual Report that: "Christchurch stations may need to be repositioned to service a redesigned city" and consequently commissioned a study to examine locations for optimal fire station deployment.

The objectives of the pilot study were to identify, by the use of an evidence-based facility location planner, optimal locations for fire stations in Christchurch while also considering the future community risk reduction and resilience role of the fire and rescue service. The study commenced with a diagnosis of existing performance and workload using data provided by the Service.

## Strategic Context

It was important to establish the strategic and operational context for the study and the objectives of the Service from which future deployment decisions could be made. A number of high-level reference documents that pre- and post-date the February 2011 earthquake were reviewed including:

- The New Zealand Fire Service Commission (NZFSC) Strategic Plan.
- The Canterbury Earthquake Recovery Authority (CERA) Strategy.
- The Christchurch City Council Draft Central City Recovery Plan.
- The National Crisis Disaster and Emergency/ Management Strategy.

The recurring theme within these strategic outcomes and objectives is the development of safer and more resilient communities, which in turn provided a focus for the future direction and deployment of fire service resources in Christchurch.

## Multi-agency Collaboration

It is important to recognise the value of collaborative and focused community engagement; reducing organisational resources and inputs while maximising outcomes. Fire stations, as fixed standalone entities, regardless of whether or not they contain 'community' facilities could be counter-productive in terms of securing positive engagement with the public and working with partner organisations in the community.

Key to future success generally and for the Service in particular comes from finding the means to harness the collective potential of all relevant agencies and groups and integrating 'resilience' into future, cross-cutting risk reduction programmes, utilising the Service's position of trust and respect in the community to influence behaviours. Such an approach could lead to an operating concept for the Service that, for ease of reference, could be described as a 'garage and shop' approach – locating functional resources and support facilities in optimum locations based on response standards and incident analysis, while creating a more mobile and public-facing workforce that operates in established community locations alongside delivery partners.

## Incident Response Analysis and Optimisation

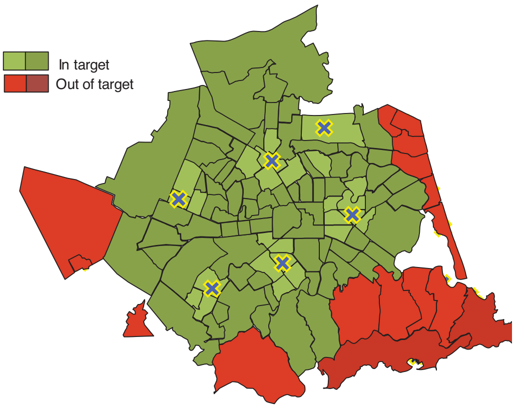
For incident response, the NZFSC has a Service Delivery Guideline (SDG) that distinguishes between appliances crewed by career and volunteer firefighters. For volunteers there is an additional three minutes added to enable personnel to respond to the station. The guideline includes a 'success or failure' factor based on meeting the response times on 90 percent of occasions (see table next page).

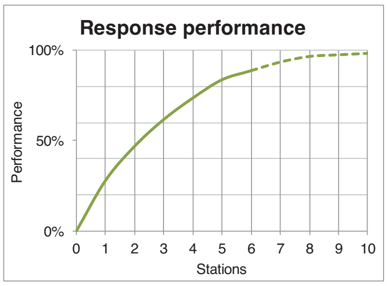
The New Zealand Fire Service Commission recognises the fact that there are a number of factors that contribute to the likelihood of survival in a structure fire and that, due to the inexact nature of fire development, the attendance of the fire service is not a guarantee of survival. It highlights in its Statement of Intent (2008/2011) that: "…the time from when a fire starts to when it becomes unsurvivable has reduced, in some cases, to less than five minutes. This means response is no longer as effective in reducing the consequences of fire. The change in the speed of fire growth highlights the need for an increasing focus on fire safety education".

## Analysis

Incident analysis and resource optimisation tools provide the opportunity to identify how, where and when operational response standards can be achieved while, at the same time, securing the necessary resources to commit to fire prevention and community resilience work. For the purpose of the Christchurch location review, incident data was used that was provided by the Service for the Christchurch metropolitan area between 1 April 2007 and 31 March 2012.

*New Zealand Fire Service appliance response guidelines*



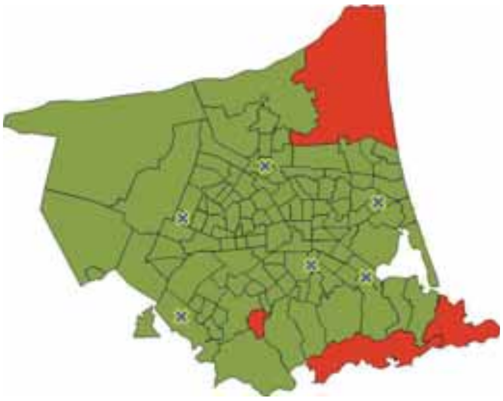


Historical demand analysis was combined with future demand predictions (based on planned building development) and existing and planned road networks. This information was used in Process Evolution's Facility Location Planner to identify the optimum station locations in order to maximise the number of incidents reached within the target times. Additional scenarios were also evaluated to assess the impact on performance if some of the existing stations were to be retained in the future. Analysis of historical demand is shown graphically in a heat-map divided into Lower Super Output Areas (SOAs), taking account of predicted demand based on future development and the red-zoning of certain areas considered highly susceptible to future earthquakes. A number of scenarios can be evaluated with different demand profiles and response targets.

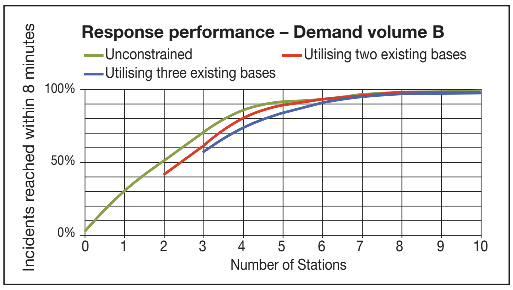
The models developed provided NZFS with an initial insight into optimum locations, but also highlighted how the optimum locations would change under different strategies relating to a risk-based approach to response. In addition, applying Process Evolution's Fire Incident Response Simulator (FIRS) would provide a full understanding of how performance and resilience can be maintained while attending simultaneous incidents with a wider mix of vehicle types.

The map shown here indicates the optimum station locations if NZFS were to have six stations in the Christchurch Metropolitan area utilising current target response guidelines. Note that the map is for indication purposes only and does not represent the potential location of future stations. The performance graph indicates the percentage of incidents attended within target compared with the number of optimally placed stations.

If response target guidelines were to change or a risk-based strategy adopted then the optimum locations could change as shown in the following maps.



A six-station, seven-minute response standard shown on the above map places the stations closer together to maximise the number of incidents that may be reached from the locations. The next map shows an eight-minute target, spreading the stations further apart and covering a greater geographical area.



Where the modelling indicated optimum locations close to existing stations the impact on overall performance of utilising these stations was evaluated. The following graph shows a comparison of performance if two existing stations were kept. By the time two additional (optimum) stations had been located there was little difference in performance.

The map diagram on the next page shows how the optimum position of a station or deployment position could change based on 'life-risk' incidents. The map on the left has total incident volume and the one on the right reflects the 'life-risk' demand. This is just an example but highlights how optimum locations may move around the geography based on risk.

## Opportunities for Consideration

As the study showed, incident analysis and modelling could be used to support optimum station location decisions based on historical incidents and current performance guidelines. This however is only one part of the risk reduction management approach relative to the future of the Service in Christchurch; the other elements for consideration being:

- An enhanced role of the Service in community resilience and public safety.
- The static and generally inflexible nature of traditional fire stations.

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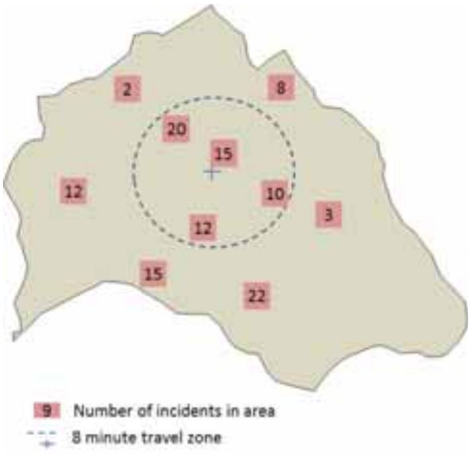

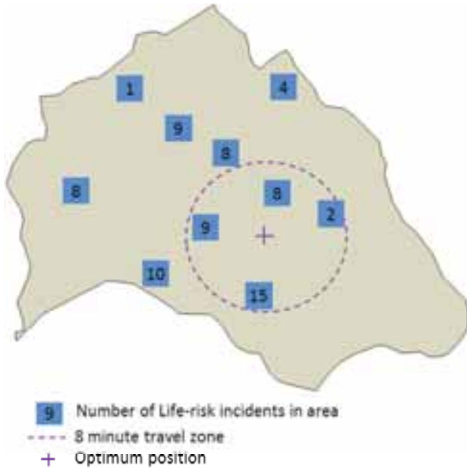

- The expected 'life' of a fire station (20 to 30 year commitment) within a changing community risk profile.
- Appliances and crews rather than stations being key to operational response intervention.
- The opportunity to locate resources in high or transient risk areas at times of peak demand (increased mobility).
- Determining the functional requirements of a station (supporting role-based activity).
- Improving opportunities to engage with communities.
- Improving opportunities to collaborate with other emergency services and resilience professionals including co-location and cross-discipline service delivery.
- Contributing to the regeneration and sustainability of the Christchurch area.
- Securing a greener footprint and reducing the environmental impact of service provision.
- The potential to secure improved safety and resilience in the City's major rebuilding programme thereby reducing the potential requirement for operational intervention and improving sustainability.
- Balancing operational intervention with prevention and education activities.
- Securing a new risk reduction relationship with the business community.
- Alternative appliance deployment models to improve working capacity.

## Community Resilience & Public Safety Roles

The rebuilding and regeneration of Christchurch provides a unique opportunity to link strategic objectives, review joint working opportunities and enter into appropriate professional relationships to secure them. How and where such opportunities might be delivered could also have an impact on the future location of fire service resources in the Christchurch area based on securing the most effective means of engaging with and supporting 'at risk' communities. The fire service is well placed to take a lead role in this work given the current level of public trust and confidence ratings of 98% (Annual Report 2011).

A potential approach to multi-agency working to secure the above, based on established risk reduction models is as follows:

1. Establish the collective organisational context – vision, mission and objectives.
2. Identify and cross-reference existing and potential hazards in the community utilising data from a range of sources/agencies.
3. Assess and evaluate the risk associated with those hazards and the sections of the community at greatest risk.
4. Evaluate the effectiveness of existing risk reduction programmes and response arrangements.
5. Identify addressable multi-dimensional aspects of risk and opportunities for improvement: develop protocols, policies and standards for multi-agency service/programme delivery.
6. Identify the resource needs and deployment arrangements including mobile and location based services.
7. Implement, monitor and review performance.

Allied with the potential advantages to be gained by the integration of fire service risk reduction objectives with those of partner agencies is the opportunity to work collectively to achieve the outcomes contained within the National CDEM Strategy: "…individual and community responsibility and self-reliance" and "…the responsibility of people and communities to provide for their own well-being", which is in keeping with the Commission's Vision and Mission of "…working with communities to protect what they value" (Strategic Plan 2005-2010).

The drive for improved risk reduction outcomes across sectors and a reduction in incident demand/fire service deployment combine to provide an opportunity for delivery partners to reduce demand and create an environment within which communities plan, prepare and where possible deal with a range of incidents themselves without recourse to emergency responders.

This approach models the integrated 'all hazards' approach envisaged by the National CDEM body and provides the possibility for all responding agencies to work together for mutual and community benefit. The Service was invited to consider the means to enable other agencies in partnership with the Service to deliver the wider community safety and resilience objectives based on the principle of transferring responsibility to the community and away from the State.

## Summary & Conclusions

In summary, the study showed that:

- It is possible to increase coverage, for example, incidents reached within 8 minutes with six bases.
- Locations are sensitive to response focus, for example, life risk versus other incidents.
- There is a degree of variation in mobilisation times between stations, by time of day and incident types.
- There is an opportunity to more closely integrate strategic objectives and service delivery in relation to safety and resilience outcomes, in keeping with the Government's Better Public Services agenda.
- Given the prevention objectives of the service, there is potential to review the role of the fire station as a base for public engagement. **APF**

**Rob Somer** is co-founder of Process Evolution.
**Paul Woods** is a Director of Fire and Life Safety Services.

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*Pic courtesy Graham Collins*

# Arson – A Real & Present Threat

Business managers have a responsibility to take fire safety seriously. We know that poor electrical wiring is dangerous, and we do not allow people to smoke inside. We consider the risks and we take appropriate measures. But how many of us actively consider arson?

**Tim Kempster**

Wrightstyle

It is a crime we think of as posing only negligible risk. It is mostly about vandalism, we believe, and happens rarely. However, according to the US Insurance Information Institute, arsonists destroyed nearly US$900 million in insured property and killed 295 civilians nationwide in 2007. Two years earlier, according to the US National Fire Protection Association (NFPA), an estimated 323,900 intentional fires were reported to fire departments and resulted in 490 civilian fire deaths, three firefighter on-duty deaths, 1,500 civilian fire injuries, 7,600 firefighter on-duty injuries and US$1.102 billion in direct property damage.

In the UK, in 2011-2012, there were 272,100 fires. Of non-residential fires, 30 percent were set deliberately. Of residential fires, some 14 percent were down to arson. Arson costs Britain an estimated £40 million every week.

The simple fact is that fire is dangerous, however it starts. Last year, 117 people died in the Tazreen fashion factory in Bangladesh – a tragic fire set deliberately, and then exacerbated by factory managers preventing people from escaping.

Nor is arson just about setting fire to buildings. In February 2009, hundreds of fires across the Australian state of Victoria killed 173 people and burned down more than 2,000 homes. Indeed, 9 percent of bushfires are set deliberately, according to figures compiled by the Australian Institute of Criminology. Another 21 percent are considered suspicious. It is estimated that arson costs the Australian population over AUS$1.5 billion annually.

It is of course extremely difficult to track down arsonists, particularly if they are setting fires in remote outdoor places. However, new technologies are helping the police to fight back. For example, in South Australia, as part of a strategy called Operation Nomad, the car number plates of known arsonists are uploaded so that traffic cameras in areas prone to bushfires can alert local police.

In the US, arson attacks on industrial/commercial buildings cost on average over US$93,000 for each attack. It is estimated that an arson attack takes place in California every 43 minutes. The USFA's National Fire Incident Reporting System (NFIRS) states that the two leading causes of civilian deaths are arson, at 28 percent, and smoking, at 18 percent. Arson is, at 26 percent, the leading cause of property loss. The same is true everywhere. For example, in New Zealand, there were 2,654 arson offences in 2008 and 6 percent of all structure fires were set deliberately.

So, who are the culprits, why do they do it, and how can they be stopped? To answer the first question, arsonists are not a homogenous group. They can be from any social class or age group although, unsurprisingly, the majority is in the ten to 25 years of age group, with the peak age for offending being between 14- and 16-years-old. Also unsurprisingly, the great majority are male. Specifically in the USA, according to the FBI, over 84 percent of arsonists are male and just over 50 percent aged under 18-years-old. Over 30 percent are under the age of 15.

So why do they do it? Again, there is no easy answer. Some, of course, are waging an insurance fraud. Others, it seems, just do it for the thrill; others from reasons of revenge or hatred. Some have alcohol or drug dependencies. Others are pyromaniacs. Most are just, well, children. Some have more complex problems. A 26-year-old serial arsonist in Hong Kong, when recently asked about his motivation, said that fire warmed his heart and made him feel safe and secure. It has been noted that serial arsonists often have cold, distant, hostile, or aggressive relationships with their parents. However, it is often the exception that proves the rule; for example, the 60-year-old grandmother who started eleven fires in California in 1995. Her motive was to give her firefighter son enough fires to prove himself a hero.

Sometimes, thankfully rarely, firefighters can themselves be the problem. In South Carolina in 1993, some 33 fire department volunteers were charged with arson. The following year, 47 more were arrested. Most fire fatalities or injuries occur in our homes, arson or otherwise, particularly homes that do not have a smoke alarm. (Being overcome by smoke or toxic fumes is partly or wholly the cause of death in over 50 percent of fires).

Some kinds of building are especially vulnerable. For example in the UK, in a two-year period to 2009, there were nearly 2,702 incidents of arson on schools, the equivalent of nearly four attacks a day. The same is true internationally: schools and children make a potent mix. Most such fires are started at night, although not always – particularly in commercial or industrial premises that are either unoccupied or under-occupied. In the latter, areas such as storerooms or warehouses provide both cover for the arsonist and, importantly, stored materials to fuel the blaze.

**Arson is not just about setting fire to buildings. In February 2009, hundreds of fires across the Australian state of Victoria killed 173 people and burned down more than 2,000 homes. Indeed, nine percent of bushfires are set deliberately, according to figures compiled by the Australian Institute of Criminology. Another 21 percent are considered suspicious. It is extremely difficult to track down arsonists, and it is estimated that arson costs the Australian population over AUS$1.5 billion annually.**

Stopping the arsonist is not easy, although companies can, and should, take sensible precautions – and, first, as part of a wider fire risk assessment, look specifically at the risk of arson. A sensible fire risk assessment should look at every aspect of the business, not least how materials are stored to what fire precautions are in place. Mitigating against arson should also include visitor control, employee training and supervision – and ensuring that flammable materials are protected. That includes rubbish stacked outside premises.

But if a fire breaks out, it does not immediately matter if it was started deliberately or not. The important thing is to get everybody in that building to safety. The fire risk assessment should, of course, have addressed each issue in the evacuation process. For example, occupants in a building should generally be able to escape away from the fire. That means having escape routes protected by fire-resistant materials or self-closing fire doors. It also means recognising that fire travels upwards, so that stairways must also be protected.

It also means having doors that open outwards to make escape easier so that, if there are large numbers of people, it minimises the crush risk. Exterior fire doors should also be checked to ensure that obstructions, such as bulk deliveries, are not cluttering them up. Where possible, it means making escape routes as short as possible, with clear signage, and building in planned (and rehearsed) contingencies for evacuating the elderly or infirm. It also means planning for electricity failure and how to evacuate people in darkness.

Most of those issues are addressed in fire and building regulations. However, many (particularly smaller) companies do not properly plan or rehearse fire drills, or regularly check extinguishers or the fire alarm.

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The business of fire safety is all about protecting lives. However, in designing in building safety we should not forget that not all fires start accidentally.

**Tim Kempster** is Managing Director at Wrightstyle

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# New Face of HazMat & CBRN Response Training

**Steven Pike**

Argon Electronics

Governments, armed forces and civil authorities are increasingly devoting time and budgets to obtaining equipment and training personnel to respond to CBRN (Chemical, Biological, Radiological and Nuclear)/HazMat (Hazardous Materials) dangers both accidental and deliberate. While terrorist threats have raised the risk, our need to establish greater sustainability in energy production has strengthened the cause of nuclear power, another source of potential danger for which firefighters and military CBRN response forces must be prepared.

Even incidents such as Fukushima have done little to quell the appetite for nuclear power. A survey conducted in the wake of Fukushima revealed a perhaps surprisingly relaxed attitude to the on-going presence of nuclear power stations. The results gathered from customers of metals and manufacturing company, Luvata, established that almost half of the respondents felt nuclear fission was safe and that it is public education on the technology, not decommissioning of power plants that is required to allay fears about the nuclear industry. Either way, nuclear power and its risks are here for some time to come.

## The Challenge

The immediate and long-term dangers of the CBRN /HazMat threat have been expressed in a 1999 paper from the United Nations Institute for Disarmament Research (UNIDIR) in Geneva, entitled *Examining Long-term Severe Health Consequences of CBW Use Against Civilian Populations.* "Exposure to chemical, biological or nuclear agents, either from military use or accidents, results in profound damage to people and the environment. Toxic residues from such weapons contaminate food and water supplies, cause sterility in people and animals, and can cause genetic damage spanning generations. Secondary consequences may spread across international boundaries, endanger millions, have effects on children yet unborn and on the fertility and health of future generations."

The paper was released shortly after the sarin attack on the Tokyo subway system demonstrated the potency of such weapons, the difficulties in preventing their use and the inadequacy of the response system. It was also deeply concerned about the fact that the long-term implications of a chemical, biological or nuclear incident differ dramatically from those posed by conventional weapons and defy responses planned for conflicts, terrorist attacks and accidents: "Unlike conventional arms, chemical and biological weapons attacks have deadly and disabling effects on emergency services personnel and persist in the environment. Such agents cannot be counteracted through conventional infrastructure and emergency responses. Governments around the world now acknowledge the real threat of such weapons and the nightmare prospect of war and terrorism that destroy people and not buildings. Increasingly frequent industrial mishaps, train derailments, air crashes and other accidents have also resulted in exposures to a variety of highly toxic substances, and local jurisdictions have found themselves ill-prepared to respond. Emergency exercises in major cities and at defence establishments have demonstrated the inadequacy of current responses to the emerging threats."

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POWER: 6,6 Kw
DIMENSIONS: HEIGHT 69 cm / 27",
WIDTH 56 cm / 22", LENGTH 113 cm / 44.5"
DRY WEIGHT: 125 Kg / 275 lbs

**MCH-6/SH**
DRIVEN BY: HONDA PETROL ENGINE
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100 L/pm 6 $m^3$/h 3,5 CFM
POWER: 3,5 Kw / 5.5 Hp
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## New Solutions

Since the UNIDIR released this paper, which understandably, expressed great concern over our capability to cope with CBRN/HazMat dangers, a whole industry has developed to meet the challenge. To maximise safety and make adequate preparations for dealing with an accident there has been an on-going technological advance and expansion in the array of field detection systems that can be deployed. This in turn has generated an ever growing and increasingly critical need for comprehensive training, which is best achieved by supplying personnel with simulation instruments, such as those produced by British simulation experts Argon Electronics, which produces state-of-the-art CBRN/HazMat simulation instruments and software that can be used to create a virtual emergency scenario. These tools are significantly increasing the capability of responders to deal with emergencies.

In preparing for HazMat and CBRN reaction and remediation, training exercises need to be not only regular, but also challenging. Training should stretch participants, and not permit them to just go through the motions. If trainees are not challenged, they are not alert; and if they are not alert, they are not learning – or, at least, not learning to a level that will assure optimum performance in the face of the most severe of circumstances. Hazmat and CBRN training must encourage the trainee to behave as if the exercise were a real event.

The challenge of creating the most realistic exercises for firefighters to learn how to deal with call outs involving toxic chemicals and/or radiological materials, without actually releasing such substances into the environment, has been a perennial problem. Increasingly, the solution has been to use electronic simulation equipment, which elevates the training terms 'realistic' and 'challenging' to a new level.

## Realistic Exercises

Highly challenging simulation exercises using this simulation equipment are now taking place in the UK and elsewhere in the world. Firefighters can safely simulate the release of chemical and radiological hazards, and, equipped with simulators in place of the real detectors, participants are able to realistically carry out their roles without risk of harm or damage to personnel, their equipment, or the environment.

For example, in what was understood to be the first UK event of its kind on such a scale, the Lancashire Fire Service was recently provided with the capability to safely simulate the release of a radiological hazard. The scenario involved the simulated crash of an aircraft following a terrorist hijack, and the release of a radioactive material at the site. Firefighters were greeted by the tail section of an aircraft that had crushed a car with passengers inside. Billowing black smoke led on to the main body of the aircraft, realistically manned by 'injured' volunteers who had previously been 'contaminated' with safe simulant materials. Other simulation sources were strategically located in the wreckage. Equipped with simulators in place of the real detectors, personnel were able to realistically carry out their roles without risk of harm or damage to themselves, other participants, their equipment or the environment.

Effective preparation and training is key to maximising safety in the event of a nuclear incident and after more than 20 years of providing solutions, Argon has seen a rise in the frequency and quality of training, supported by its own innovations. By combining strong relationships with leading detector manufacturers with the development of versatile new training platforms, companies such as Argon are enabling safe and cost effective preparation for emergencies and an awareness of this is essential when considering the risks presented by nuclear energy.

Simulators offer great flexibility in planning exercises. Instructors can prepare a scenario where the trainees do not know what they will encounter, which is extremely useful because in a real life situation the firefighters responding to an alert do not always know exactly what they are looking for.

## Simulation Instruments

Instructors can now manage the detection instrument training of multiple personnel, selecting the parameters for the activation of simulation instruments using, for example, PlumeSIM, a CBRN/HazMat response training simulator that provides enhanced flexibility and ease-of-use in field exercises and table-top training for counter terrorism, HazMat or nuclear incidents.

PlumeSIM is designed on a Windows platform and allows multiple trainees to be managed and monitored from a computer at a central location. The PlumeSIM software enables users to plan exercises on a PC or laptop without system hardware, offering a portable simulation system with easy-to-use menus that can be swiftly set up and used to create diverse variety virtual emergency scenarios.

The equipment enables an instructor to plan a scenario that involves either single or multiple releases of hazardous materials and offers the potential to define a series of release characteristics, such as duration, persistence and deposition, for an extensive choice of substances. The instructor setting the training exercise can even define the environmental conditions that would affect the movement and/or state of the virtual plume during the timespan of the operation.

Trainees can interact in three modes: table top mode, field exercise mode and post-event exercise review mode. Table top mode offers the opportunity for trainees to navigate a projected on-screen scenario using a standard gamepad controller, offering a level of familiarisation with the simulators that enables them to gain more from the subsequent field training exercises. Field exercise mode enable them to physically investigate a training area, where PlumeSIM triggers readings and alarms on the simulation tools they carry by locally re-broadcasting the threat scenarios from deployed personal player units that track their progress using GPS data. All data is recorded and can be analysed after the field exercise using the after-action exercise review mode; all player movement and simulator activity can be reviewed by instructors and trainees at debriefing, providing individual trainees with detailed feedback on their performance, maximising the potential for the students to learn from their experiences.

During both the planning and review modes, PlumeSIM can also be run in accelerated and paused time to firstly evaluate the validity of the scenario design, and then optimise the replayed exercise appraisal within a compressed time period. A pause can sometimes be extremely valuable in allowing instructors to evaluate, test or validate a student's progress and perhaps recommend changes in approach to ensure all participants get the very best out of the exercise. APF

**Steven Pike** is Managing Director of Argon Electronics

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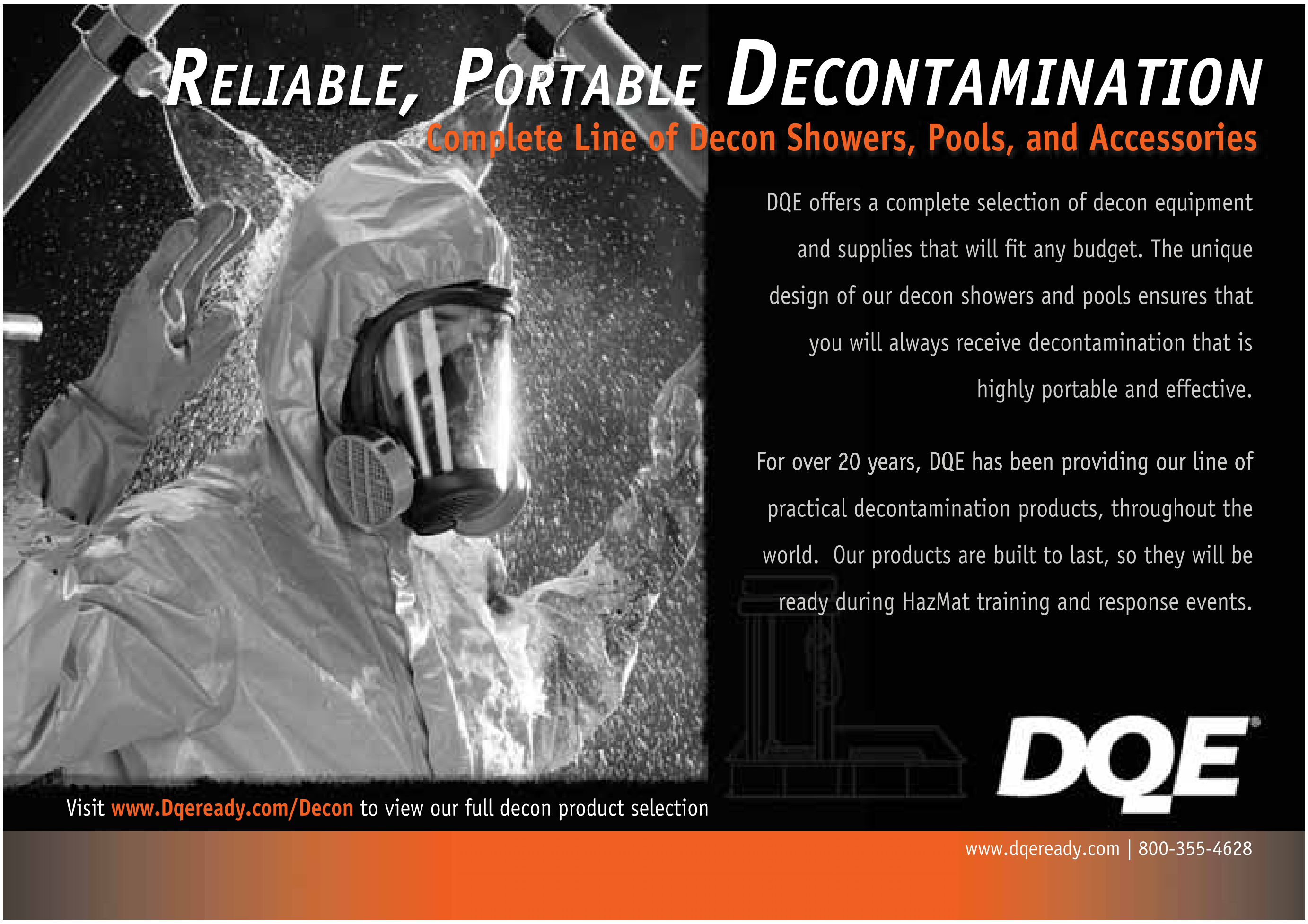
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# Supplemental High-Rise Evacuation

Authorities in many countries have make it mandatory for owners of designated premises to draw up plans to cater not only for fire emergencies, but also address other fire related emergencies or hazards affecting life safety. This is regardless of whether the hazard is initiated by accident, pre-meditated actions, or natural causes such as earthquake. So, what evacuation technologies are commercially available to address the limitations of the building egress in enhancing an emergency response plan for safe evacuation?

**John Ng**

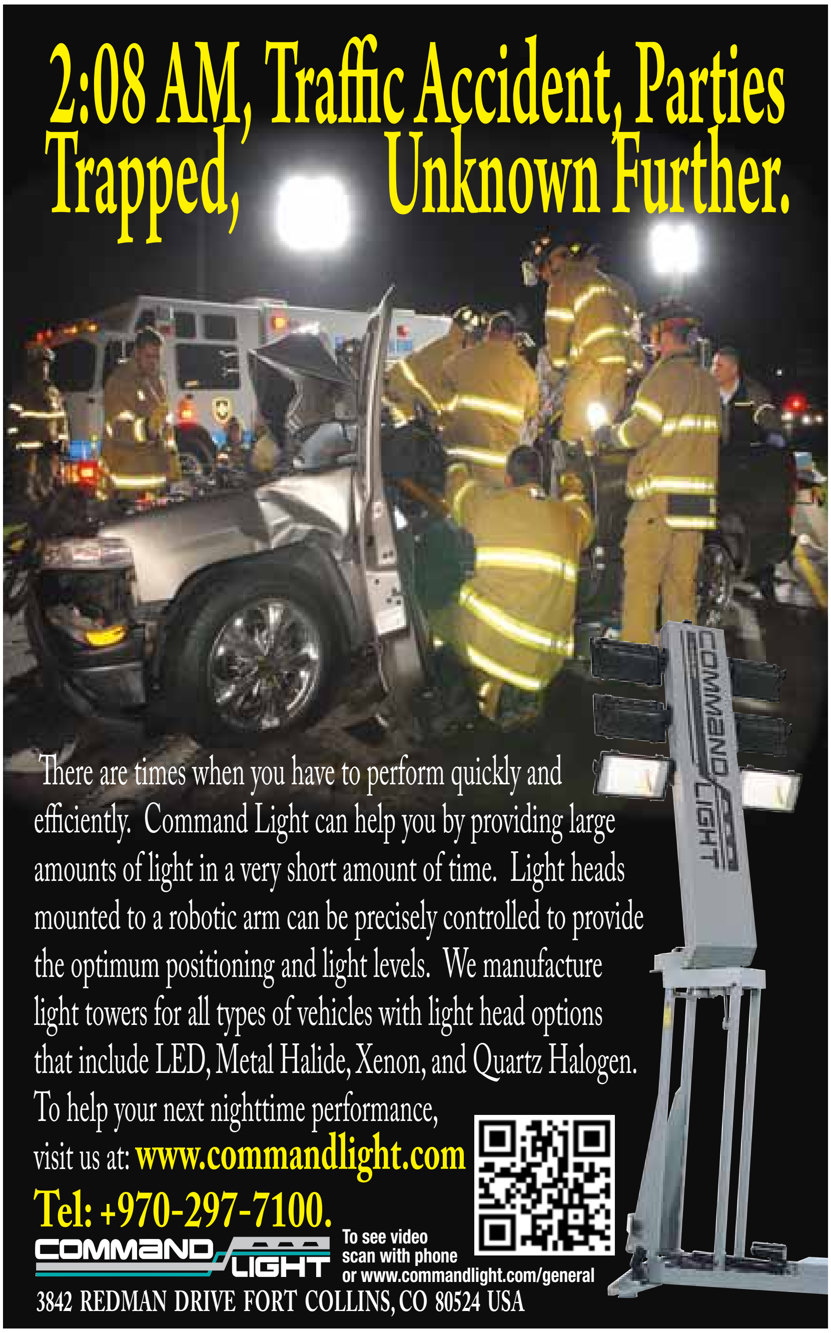
Escape Consult
Mobiltex

There are many reasons that may cause the movement of people in an emergency in a building, such as fire, acts of terrorism, earthquakes or major power outage. In these situations, occupants may need to evacuate the building as soon as possible. In dealing with such emergency evacuations, the evacuation of people with special needs and the blockage of escape routes are of critical important because as they will increase escape difficulties and evacuation time.

People today are not comfortable with long egress times. Yet, the use of passenger lifts for emergency evacuation is not advisable due to the potential for people to be trapped if the power supply is interrupted and the danger of the lift being opened inadvertently on the fire floor, potentially exposing occupants to danger. The use of an evacuation lift, if available, will always be the best option for the vertical escape of those who require assistance. A fire lift is intended to provide a vertical means of access for firefighting and rescue operations and should not be designated as an evacuation lift unless there is more than one fire lift provided in the building. The process of vertical evacuation is highly labour intensive and can be chaotic without a proper evacuation plan and coordination.

Traditionally, dealing with emergency evacuation is by code compliance. Even though various egress designs can be code compliant to meet their original occupancy needs, they will perform differently in emergency evacuations. Some may lead to a shorter evacuation time; some may prevent occupants to escape efficiently. Fire is the most complicated emergency in terms of emergency movement because of the rapid change to untenable conditions; the blocking of spaces will change with time due to the smoke movement to other areas and the blocking of some exits.

The changing demographics and the public concerns about safety in the evacuation of tall buildings are the prime movers in the development of new evacuation techniques to accommodate people with special needs of any physical condition, be it age or impairment. These concerns have also led to a call for a fundamental rethinking in the use of evacuation technologies to supplement the traditional methods of building evacuation.



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## Supplemental Evacuation Technologies

Taking the lessons learned from 9/11 and terrorist attacks against hotels and other iconic buildings, America's leading fire safety body, the National Fire Protection Association (NFPA), issued new Life Safety Codes approving the use of "Supplemental Evacuation" (SE) technologies to assist people exiting high-rise buildings in an emergency. The NFPA has also provided guidance to building owners and others considering the voluntary use of such systems and equipment. If provided, it is not intended to replace existing code-mandated exits or stairwells but rather to offer an alternative means of egress when traditional escape routes are blocked or unsafe. Exceptions to this include the sick, injured or impaired for whom new S/E technologies should be considered in giving them a chance of escape from danger.

NFPA also approved the use of supplemental evacuation technology in official and/or mandatory evacuation plans. If SE is provided, it should be used in accordance with the building evacuation plan as, for proper use, no single set of requirements can cover all contingencies. The plan should include deployment by the authorised person(s) to provide supplemental evacuation means or a means of escape for people who cannot use the standard means of egress. Staff and the person or persons authorised to direct the deployment and operation the system should be trained in its procedures. Generally, deployment will be when preferred options no longer exist or, when all other means of egress or escape have been compromised; just as the deploying a lifeboat from a sinking ship.

## Supplemental Evacuation Resources

The Supplemental Evacuation resources provide redundancy and survivability into the building evacuation system, while also alleviating problems related to building evacuation in emergency situations. This article examines the capabilities and features for a range of innovative SE resources and its usefulness to the in-house emergency response team.

### ● Escape Chutes

There are different versions and types of escape chutes – vertical sliding descent, spiral sliding descent, and slope sliding descent – and the chute constructions also different from one manufacturer to another.

One particular escape chute, Ingstrom Escape Chute, allows people in high-rises and other tall structures to safely slide vertically down to the ground. This evacuation chute has special characteristics and safety features that are uniquely different from other chutes. The chute has a three-layer construction made up of technical fabrics that protect users from flame, heat and smoke. The inner layer is made of Twaron and a PVC chlorofibre that is extremely strong (up to 5,600 kilogramme-a-metre width) and heat resistant up to 650°C. The middle layer is a flexible elastic fabric made of Lycra and modacrylic fibres. This layer acts as the ‘brake’ – think of knee support fabric – for the evacuee, who can control the speed of descent by extending arms or legs. The outer layer is made of tough, fibreglass that can withstand temperatures of up to 750°C. The unique feature in this chute is that the chute sleeve construction does not consist of springs or steel coil as in other chutes.

In essence, these long tubes offer exterior and interior egress path solutions, ranging from single-entry and multi-entry to mobile rescue systems. The single-entry system is an exterior egress solution that is intended to provide alternative paths of egress in the case of critical compromise of the primary path, and to provide additional paths of egress to alleviate congestion in the primary path. Egress path inside the chute tube protects users from the effects of fire. It is permanently installed at a fixed location for use as an “emergency exit”. It can be retrofitted or mounted on the rooftop, balcony or corridor, window ledge, or other special evacuation opening in the building, giving occupants access to the chute on that floor. One chute serves one floor and the maximum length of the chute for this solution is 50 metres.

The multi-entry system is an interior egress solution permanently installed inside a vertical shaft/duct inside the building whereby one multiple chute serves several floors. It allows occupants to gain access to the chute at each floor or at each alternate floor where several levels can be simultaneously evacuated. There is no limitation to the height of the building for multi-entry installation. The mobile-rescue system is an exterior egress solution mounted on the bucket of a fire department’s aerial platform used for height rescue.

These systems are accepted by fire authorities in several countries as a practical alternative to vertical escape, in particular where there are space constraints for the construction of a second staircase, as is often the case with older buildings. These systems are also installed in high-hazard industries as a practical alternative to vertical escape in life threatening situations.

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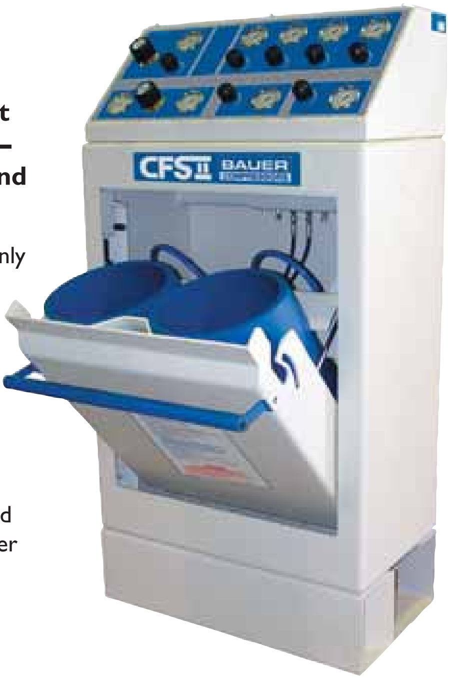

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- **Controlled Descent Devices**

One particular controlled descent device, the MARK Save A Life, is a relatively safe, simple, low cost self-escape/rescue system for high-rise structures. The unique feature of this device is its double self-braking systems that provide a continuous automatic "hands off" operation and a lifeline to the ground for buildings up to 300 metres high. As one descends, the other rope ends comes back up for immediate reuse. Speed of descent: approx. 0.6 metres-a-second and the maximum load for descent is about 150 kilograms.

It is an exterior egress solution that is intended to provide alternative paths of egress in the case of critical compromise of the primary path. It can be installed at the rooftop, balcony or corridor, window ledge, or other special evacuation opening in the building, giving occupants access to the system on that floor. The portability and flexibility of the system provide an efficient and cost effective strategy to create multiple "escape stations" at strategic locations in the building. Where utilised as part of the building exit strategy, one or more systems serving each floor can have an impact on the safe evacuation of occupants. This pre-planned approach would provide everyone inside the building with ready access to an evacuation system in the event of life threatening emergency. It also enables the system to be relocated to another pre-planned safer location away from fire. The system can also be moved to another location when the company moves to a new premise of similar height.

MARK Falcon is the standard model with basic feature used in multi-level buildings for self-escape. MARK Hawk is a rescue device that has two open eye bolts added to the standard model. This rescue device was developed for professional users, such as the fire services. It also provides a practical vertical escape solution for workers working at height to descent quickly from danger.

- **Evacuation Chairs**

Accessibility regulations have resulted in a growing number of occupants with mobility limitations requiring egress assistance in "special needs evacuation planning" that would enable them to get down and out of high-rise buildings in an emergency. This includes the consideration of the evacuation capabilities and needs of occupants with disabilities; either permanent or temporary.

One particular evacuation chair, the Evac+Chair, is internationally accepted for the stairway evacuation for people with reduced mobility, who would have difficulty leaving the building when the lifts is out of service due to breakdown, under maintenance, power outage or in an emergency. The chair is engineered to convey smoothly using a patented continuous rotating V belt that ensures safety and allows the user to control the chair's descent down the stairs with relative ease, regardless of the passenger's size. The chair is designed to allow people with mobility difficulties to be helped to move down stairs and, in some case, up stairs during an evacuation. Evacuation chairs are used where it is not safe to use lifts to evacuate, or

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where an evacuation chair is less risky than having a disabled people remaining behind in a refuge area. It usually requires one or two operators to guide the chair down the stairs.

- **Emergency & Exit Lights**

It is a standard requirement in most building codes for multi-story buildings to have electrically wired exit signs and emergency lighting with back-up battery. These lights are designed to work automatically during power outage.

- **Photo-Luminescent (Glow-In-Dark) Evacuation Signage**

When electricity fails and the electrically wired exit signs and emergency lighting are not functioning, photo-luminescent technology could be the guiding light that leads building evacuees to safety in an emergency. The photo-luminescent components require no electricity since they absorb energy from ambient light and re-emit it when the light is out. The performance of a photo-luminescent component is measured primarily by brightness and the amount of time it produces light, with the light level slowly decreasing over the time.

- **Escape Smoke Hood**

The escape smoke hood is a personal protective equipment that protects a person from smoke inhalation during a fire evacuation. One particular escape smoke hood, the i-Evac, is certified to the American National Standard for smoke hoods ANSI/ISEA 110-2009 and to the NIOSH 42 CFR 84. The unique feature of this smoke/fire hood is that it also provides excellent protection against hydrogen sulphide H2S and uses a silicone neck dam. Silicone neck dam provides an excellent protection factor that eliminates agents entering the hood through the neck dam. This escape smoke hood has been designated as an anti-terrorism technology by the US Department of Homeland Security.

### Building Evacuation Strategy

There is no one size evacuation strategy that fits all buildings. The pre-planning concept is not new but expanding it to include SE capability elevates the evacuation strategy to a new level. Creating and carrying out reliable evacuation plans will be greatly enhanced with the inclusion of high technology SE systems at designated "evacuation stations" located strategically in the building. Just as passengers on a cruise ship receive lifeboat assignments, each office, apartment or other unit would receive a designated evacuation station

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nearby for use if needed. Failure to develop an exit strategy is a key factor in many large fatality fires.

### Localised Rescue and Evacuation

All properties should provide at least one hour's fire protection. The typical high-rise fire is contained to localised areas in the structure. In many cases only the occupants in the fire floor, directly above and next to the source are at immediate risk and in need of attention. They must be evacuated immediately to avoid smoke inhalation that causes so many fatalities. SE pre-plans for that contingency, by locating escape stations on each floor, thereby assuring everyone of timely access.

### Shelters in place (SIP)

Many buildings have adopted the safe room and refuge area concept providing occupants with a hardened or protective environment to seek temporary shelter during an emergency. A strategy preferred by some fire departments is to have occupants that are outside the danger zone stay in place and wait to be instructed by arriving responders or designated individuals. Unless there is imminent danger to life or health, SIP may be the best policy. The theory certainly fits well in the SE model, which advises people to avoid the stairs and remain in their space or designated shelter until or unless they have to escape. Such locations are ideal for deploying SE systems.

### Total Building Evacuation

In the aftermath of the World Trade Centre attacks in 2001, one of the recommendations from the National Institute of Standards and Technology (NIST) calls for tall buildings to be designed to accommodate timely full-building evacuation of occupants when required in building specific or large scale emergencies, such as widespread power outages, major earthquakes, fires or terrorist attacks. The SE concept anticipates occasional mass evacuations and meets the need with multiple evacuation stations strategically located throughout the structure and close coordination with local responders to conduct rescue operations as needed.

### Company Emergency Response Team

Authorities in some countries required designated premises to have in-house "company emergency response team" (CERT). Buildings that have competent personnel in CERT and are well-trained to use SE equipment minimise the risk to lives, property and disruptions to operations. The function of the CERT is to respond immediately to emergencies prior to responder's arrival in an emergency. Time is of the essence in an emergency. CERT not only provides a first line of defence in mitigating incidents, but also timely evacuation of people inside the premises. An important tactical advantage for the CERT is to evacuate people prior to responders' arrival, reducing or eliminating evacuee traffic in the stairwells, leaving them clear for responders' use. With the stairwells clear, responders will be able to gain access to the building more quickly if the fire lift is unavailable, and focus on firefighting and saving the building.

### Conclusion

Gone are the days of plans for fire emergencies that may never be used until too late. Today the emphasis is placed on an holistic approach in drawing plans for emergency response that deal with all kinds of emergencies – fire and non-fire related. The making of an emergency response plan (ERP) is an on-going issue requiring genuine cooperation from all willing parties and the plan should also support the concept that no one should be left behind (equal opportunity for evacuation).

The emphasis is also placed on being proactive in ensuring plans are rehearsed with adequate equipment and properly in-house trained personnel – CERT. Supplemental evacuation resources not only conform to the emergency response planning requirements of building owners and/or management in making high-rise evacuation quicker and relatively safer, they also offer a worry-free solution to those people who have difficulty using stairs, giving them the same opportunity as able-bodied people to escape. Just as each building presents its own unique problems, so the provision to each SE solution should reflect those needs. **APF**

**John Ng** is Business/Market Development Regional Specialist at Escape Consult Mobiltex

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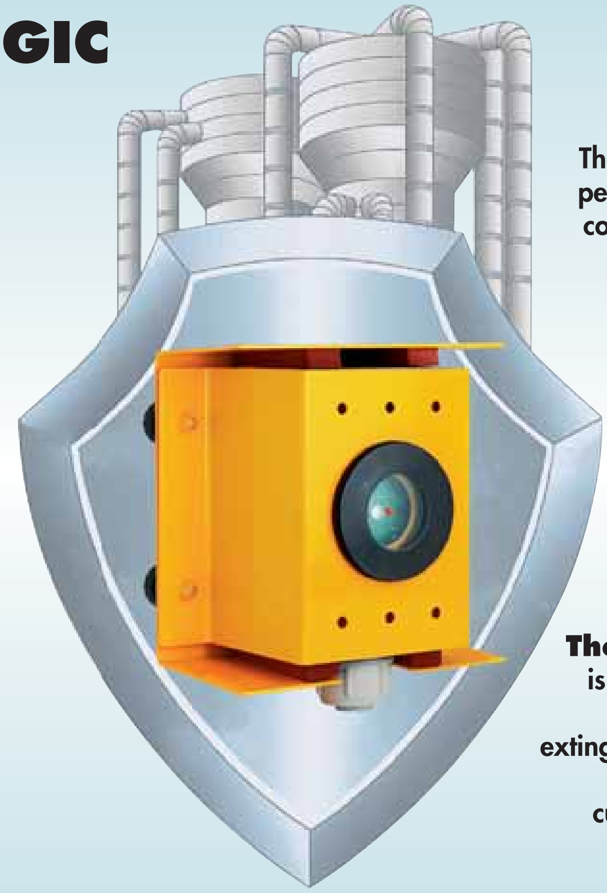

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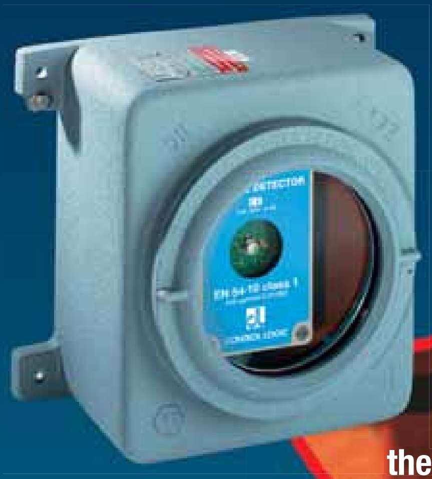

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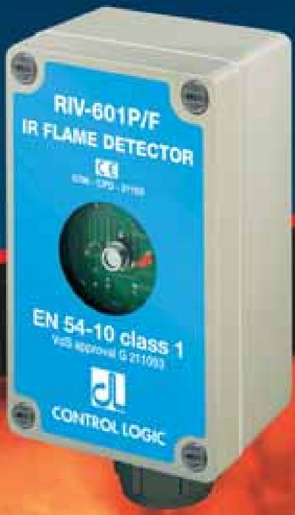

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# Research Informs Firefighter Safety

**Nathan Maddock**

Bushfire Cooperative Research Centre

A Bushfire Cooperative Research Centre (CRC) collaborative project aims to provide fire agencies around Australia with critical intelligence about how fireground conditions affect firefighters' ability to work safely and efficiently. The project needs more firefighters to participate in scenario simulations to help with the study.

Firefighters face constant challenges on the fireground. Exposure to smoke and high temperatures, coupled with little sleep, can affect performance. But what are the full impacts of these conditions on firefighters, and how can the risks be managed? A national research project, part of the Bushfire CRC's *Managing the Threat* Program, undertaken by researchers from Deakin University in Melbourne and CQUniversity in Adelaide, is helping to answer these questions.

The project is led jointly by Dr Brad Aisbett and Associate Professor Sally Ferguson. Testing in simulated scenarios has commenced, with participants enlisted through support from Victoria's Country Fire Authority, South Australia's Country Fire Service, the Australia Capital Territory's Parks Conservation and Land, the Tasmania Fire Service, the New South Wales Rural Fire Service and New South Wales National Parks and Wildlife Service. The assistance of these agencies was integral to the design of the simulation, ensuring the study replicates real conditions as closely as possible.

The critical missing element now is volunteer firefighters. The research team is seeking volunteers from all fire and land management agencies to participate in the project with testing scheduled throughout 2013.

"Every summer, firefighters face extremely tough conditions," noted Dr Aisbett. "They are awake for long periods of time, working in hot and smoky conditions. But when it comes to developing guidelines around safe working conditions in those environments, fire agencies cannot draw on specific job-relevant research. The available research looks at only one stressor at a time. That is, in isolation, what is the effect of exposure to heat, smoke or sleep deprivation? But firefighters face all of these conditions together."

The project, nicknamed 'Awake, Smoky and Hot', is investigating the individual and combined effects of sleep deprivation, heat and smoke on the physical and mental aspects of firefighting. For fire agencies, managing the health and safety of firefighters during bushfire deployment requires information about the effects of exposure to these stressors. This bushfire-specific research is critical to develop evidence-based strategies to preserve the health, safety and productivity of firefighters

*Pic courtesy of Bushfire CRC*

fighting bushfires. Importantly, the goal is not to remove firefighters from the fireground; it is to provide fire agencies with the best available evidence that they can use to manage the risks to their firefighters.

Associate Professor Ferguson highlights the unique design of the project, which simulates a three-day campaign fire scenario. "We have replicated jobs as closely as possible. As a result, volunteers for the project will complete research tasks that look almost like jobs they undertake when fighting a bushfire, like dragging heavy hoses, rake hoe work and hose rolling – all in full firefighting uniform. The tasks are repeated each day of the study, both to simulate a bushfire deployment as closely as possible, and to measure how performance changes over a number of days. Critically, we can control the variables and repeat them to ensure validation of the research."

Coordinating the research simulation is Dr Bradley Smith, a post-doctoral research fellow at CQUniversity. Dr Smith noted that in addition to physical performance, the study measures changes in both physiology and mental functions. "We measure how exposure to the combined effects of heat and smoke, coupled with sleep deprivation, impacts on firefighters' cognitive performance such as memory, reaction time and concentration. Firefighters need to be alert and switched on all the time. They are often placed under not just physical strain but mental strain as well, and they are required to make split-second decisions that could impact on themselves, their colleagues, the environment and those they are working hard to protect."

Researchers will assess the physiological changes that occur during physical tasks such as repetitive tyre dragging and tyre pulling tasks, representative of the carry and drag actions that comprise the principal fireground tasks of hose advance and rake hoe work. This will provide real data that will help fire agencies manage their firefighters.

"We measure blood pressure, level of any dehydration, blood glucose levels, stress hormones, lung functionality, grip strength, static balance and carbon monoxide exposure," added Dr Smith. Sleep patterns are also measured and participants are asked to rate their effort, thermal sensation, motivation, feelings of hunger and food cravings throughout the simulation.

"An in-depth study incorporating experts in sleep, cognitive behaviour and exercise physiology has not been undertaken before. The collaboration between these fields is exciting," said Dr Smith. The findings from this research will provide an evidence base on which to develop specific training and guidelines to better assist the health and safety of firefighters. The benefits are already flowing directly to firefighters.

Neil Cooper, a Bushfire CRC lead end user and Manager of Fire Management at ACT Parks Conservation and Land agrees. Firefighters at Parks Conservation and Land participated in a research simulation in 2012, and Mr Cooper believes their involvement has already aided not just their own development, but the organisation's as well. "This study allowed our firefighters to be directly involved in a high-level research project of national significance," said Mr Cooper. "It was a great personal development opportunity for them, and gave them an insight into how the research would benefit not just themselves, but their colleagues and counterparts around the country.

He continued; "Through the participants, Parks Conservation and Land found the project to be an excellent way to disseminate the important health and safety information gained during the simulation throughout the organisation. As well as providing invaluable data to inform guidelines on keeping firefighters safe, the simulation was an excellent team-building exercise, which is a great value add, and one that I'm sure will be replicated in further research simulations."

A volunteer firefighter who has participated in the simulation (but cannot be named due to research ethics) noted the research had a positive impact and highlighted the knowledge and understanding of the research team. "The willingness [of the researchers] to help us [participants] understand why we were there and why we had to do specific exercises was outstanding," noted the participant. "I know the hours and sweat that I put into the study will help me and my fellow firefighters in the field."

Dr Smith echoed these thoughts. "Feedback we have received has been positive. Participants have been really satisfied with the research process, that the level of detail in the tasks is as accurate as possible and that they feel they have been involved in a worthwhile process."

A number of simulations have already taken place, but many more are needed to gather enough data to inform the results. The research team is seeking more firefighters from all fire agencies. Simulations will take place in Adelaide and Melbourne in 2013, with the possibility of testing at other sites.

A short video that explains the research and shows the simulation in action is available on the Bushfire CRC YouTube channel**.** More information about the project, including expressions of interest in participating, is available by contacting Dr Bradley Smith on +61 8 8378 4528 or b.p.smith@cqu.edu.au**.** Additionally, volunteers can register their interest in participating on the CQUniversity website, http://tinyurl.com/akb3r7v**.** **APF**

**Nathan Maddock** is Communications Officer at Bushfire Cooperative Research Centre

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# Selecting the Righ Monitor

**Mike Willson**

Willson Consulting

With such a bewildering array of firefighting monitors available these days, and a wide choice of applications for which they may be suited, it can be daunting to clearly identify the type best suited to your situation and meet your specific needs. There is bound to be a suitable unit, but let us look at a "broad brush" approach, to help determine how we can begin simplifying this often complex selection process.

Firefighting monitors are widely used across a broad range of applications, fighting combustible material and flammable liquid fires, as well as exposure cooling duties. They can be found in process and storage areas, loading jetties, in ships transporting flammable goods, tug boats, aircraft hangars, offshore platforms, helidecks, power stations, defence facilities, a wide range of fire trucks and more.

### Water Type Can Help Inform Choices

Let us start with your water supply.

The type of fire water being used through the monitors can help to narrow down your requirements. Good quality freshwater and inland sites may indicate that carbon steel or cast iron monitors could be suitable. If pressures are low, weight is a big issue with either portable- or vehicle-mounted systems, so light alloy or brass tubing may be appropriate for lower flow applications. If your monitors are likely to be using seawater, brackish or borehole water, be located offshore or in coastal environments, then corrosion-resistant gunmetal, aluminium bronze or, to a lesser extent, 316 stainless steel, are likely to be more appropriate materials to give the durability and reliability required under such harsh environments. Mild steel, brass and aluminium alloy will quickly be corroded under these conditions, and are therefore generally considered inappropriate.

### Monitor Design

The water pressures proposed will also affect the design and thickness of the waterways, which is also an important factor to consider early. The thrust or reaction forces generated by the water leaving the nozzle will increase with flow rate and inlet pressure. These reaction forces need to be directed through the pivot points for both vertical and horizontal monitor movements. If the monitor is distorted or suffers some minor misalignment, these reaction forces can exert an unwanted sideways or vertical force on the monitor, which may cause it to move from its set position with potentially serious consequences. This could cause it to spin, deliver water or foam into an unwanted area, bend the supporting pipework or, if trailer-mounted, actually topple over. This could also risk injury to firefighters, other site personnel, or site systems.

Dual or split-waterways that come together before the nozzle generally suffer increased turbulent flow that increases pressure loss across the monitor, leaving less pressure to project the water from the nozzle. Very tight single-waterway bends also increase turbulence and water "spin" from the nozzle, reducing the overall distance the water or foam can be thrown. Streamline sweeping waterways with vanes inside usually help reduce this turbulence, enabling the monitor to deliver a slightly longer and more targeted throw and delivery pattern.

### Fixed or Mobile?

Next we need to consider how the monitor is being used.

Is it being fixed in a permanent position, or is it more useful as a mobile unit, either capable of being stowed as a portable unit on a fire truck (if the desired flow rate is typically less than 4,000 litres-a-minute), or towable into position on a trailer for greater stability where larger flow rates up to around 40,000 litres-a-minute are required? This ensures the jet reaction forces are handled adequately and within the boundaries of the trailer or portable monitor "legs", to keep the unit operating safely.

If it is to be fixed permanently in position on pipework, perhaps it is required to be a manually operated unit, initially with pre-set elevation angle and spray pattern to operate from a fixed position once the water supply is turned on, which is often the case with exposure protection applications.

### Automatic Oscillation Delivers Rapid Targeted Firepower

Maybe you have a more dynamic requirement, where automatic oscillation through a prescribed arc is required to deliver a wider coverage without manual intervention, but with the ability to interrupt the oscillating mechanism at any time, adjust and then re-engage it, as fire conditions change? Oscillating monitors are becoming increasingly popular, particularly when the oscillating mechanism is not driven by an electric motor but is driven by an enclosed water turbine or Pelton wheel, so the unit begins oscillating as soon as water pressure arrives.

These are widely used for protecting offshore platforms and helidecks, aircraft hangars, small oil storage facilities and perhaps pipeline pump stations, as well as effective exposure protection for sensitive buildings. They can even be effective controlling dust on resources such as coal or wood chip stock piles. Among the front runners is the OMB36 oscillating monitor with a streamlined low pressure loss 80mm waterway in gunmetal from Angus Fire; a long proven and popular choice for hostile offshore environments as well as aircraft hangars, tank cooling and much more.

Traditional protection for aircraft hangars relied on NFPA 409, defining extensive foam-water

# t Firefighting

deluge systems in the roof, with monitors covering only relatively small shielded areas under the wings. More recently, operators have been moving away from these complex systems in favour of faster acting oscillating monitors to cover the whole hangar floor area and over-wing protection.

A growing belief that most hangar fires occur as pool fires under the fuselage at floor level is driving this change. Automatic oscillating monitors can cover huge areas of hangar floor with an effective foam blanket within seconds of actuation. Generally faster at delivering foam to the floor than foam deluge from the hangar ceiling, such monitor systems do not suffer adverse up-draughts from the fire, subsequently reduced foam coverage, or reduced efficiency. Such oscillating monitor systems also require lower water demands, reduced pumping capacities and simpler pipework, so are generally more cost effective for installation, maintenance and long term operation.

## More Widespread Hazard Areas Call for Remote Control Capability

Maybe the hazard is less specific in terms of location, and you need to protect a wider more general area, any part of which could be involved in fire?

You may also need to be in a safe place, remote from the hazard that may involve gas release or other hazardous atmospheres. This may occur at marine terminals and loading jetties; however, distance from the hazard is also relevant on incineration sites, landfill waste reclamation centres, power station turbine halls or any number of potential process cooling applications. In these cases remote control monitors (RCMs) can offer the flexibility required, particularly in areas where there are few appropriately trained operators. These RCMs have motors or actuators that change remotely, for instance, the direction of the monitor whether up/down, left/right, or jet/spray on the nozzle to effectively deliver water, non-aspirated foam or aspirated foam onto the specific part of the hazard involved.

## Is Electric or Electro-hydraulic the Right Answer?

The choice of remote control can then be further distilled by the type of remote monitor operation that is best suited to your site and application. Where there may be protected 3-phase power supplies with immediate battery back-up in an emergency, an all-electric remote control monitor can offer the ultimate flexibility. This allows electric power to drive the motors on the monitor from long distances, and may even involve and rely on position indicators and video cameras, to oversee the hazard area.

Where the RCM is located in a hazardous area there are two electric-powered options. Where the unit is operating without hazardous atmospheres, standard electric motors and control equipment is acceptable. Where the RCM is operating inside a hazardous atmosphere, even if that may occur only during an emergency or plant failure, the electric motors and switching equipment need to be manufactured and approved to international explosion proof standards, such as ATEX (Atmosphères Explosibles) under European specifications or NEC (National Electrical Code) in the USA.

Explosion-proof motors are required for use in Zone 1 areas with flammable gas or hazardous atmospheres, where ignitable concentrations of flammable gases, vapours or liquids are likely to exist under normal operating conditions. Under the American system this would equate to Class 1 Division 2, although ATEX is generally considered a more comprehensive system covering a wider range of parameters and is therefore becoming more popular for monitor specifications.

Fire monitors and their control equipment residing within the ATEX Zone 1 area are required to be "Group II" approved with an explosive or flameproof enclosure for motors and control panels located within the hazardous area. These would normally be classed "EExd" flameproof (that is, that a flame cannot escape from within the box or enclosure). It also requires a temperature rating indicating the maximum surface temperature the equipment can generate. For example "T4" indicating a maximum surface temperature of 135°C is reached during equipment operation or fault condition, which is below the ignition temperature of the gas in the hazardous atmosphere so cannot trigger an incident during use. This is a common temperature requirement for a wide range of operating equipment within industrial areas. Ingress protection (IP) must meet minimum IP54 requirements (protection from dust and splashes of water) but, depending on duty, IP 55 is more widely considered a minimum. IP55 requires the enclosure to exclude dust and exclude water projected from a nozzle, while protection from infiltration of dust and immersion in water requires a higher IP67 rating.

## All-hydraulic Control May be the Ultimate Intrinsically Safe Choice

Intrinsically safe RCMs using hydraulic actuators instead of electric motors is an interesting alternative option adopted by many operating in hostile conditions. Care must be taken when choosing RCMs, because power supplies are often routinely and automatically shut down across some sites during a fire emergency, which could render an electric RCM inoperable. Cutting electrical power reduces electrical hazard risks for firefighters, other emergency responders and evacuating employees, plus it reduces the risk of incident escalation from short-circuit flashes, power overloads or unexpected earthing events in other parts of the site, previously unaffected .

In these situations, a hydraulically-actuated RCM option may be more relevant and suitable. While many hydraulically controlled monitors have quite severe limitations on distance between the monitor and hydraulic power pack, which is often then controlled electrically, the leaders can use no electric power whatsoever.

By using hydraulic actuators powered by a

**Table 1. Summary: Main advantages and disadvantages of the 3 main types of Remote Control Monitor (RCM) available.**

| All Hydraulic RCM | Electro-Hydraulic RCM | All Electric RCM |
|---|---|---|
| ***ADVANTAGES:*** | | |
| Intrinsically safe and compact for use in extensive hazardous atmospheres. | Electro-hydraulic interface pack located generally at base of monitor, reducing cost of hydraulic tubing. | Flameproof motors enable operation within hazardous atmospheres. |
| Hydraulic motors are usually less expensive and simpler to use. | Electric interface allows long distances from main control panel. | Option for secondary control panel positions within the hazardous area. |
| Inherently reliable with low maintenance requirements. | Flameproof electrics may not be needed in non-hazardous atmospheres, which saves cost. | Maximum flexibility of control options available, including position indication from built-in encoders and electronic controls that can track the nozzle position automatically, even in smoke laden areas. |
| Providing water main pressure available, system should operate correctly. | Can be operated from unlimited distances. | Can be operated from unlimited distances. |
| Some units have manual override facility in case hydraulic power pack should fail. | | Can be linked to Closed Circuit TV monitoring and video recording systems. |
| No need for limit switches or electric motors. | | |
| All corrosion resistant materials used. | | |
| Suited to operating in mines, saline and normally humid and moist atmospheric conditions. | | |
| ***DISADVANTAGES:*** | | |
| Hydraulic tubing more expensive than electric cabling. | Hydraulic control section usually short, typically <10m, so not ideal for use in hazardous atmospheres, unless all electrical components are IP and flameproof rated, which adds cost. | High IP and flameproof specifications likely to be required for operation in hazardous atmospheres and permanently humid and moist conditions, which adds cost. |
| Limited to around 300m remote operating distance. | Electro-hydraulic interface usually at base of monitor or tower and not outside any hazardous area. | Likely to require more routine maintenance, particularly in hostile environments. |
| No facility for secondary panels or position indicators. | 2 systems in use, so more to go wrong and therefore likely to require higher levels of routine maintenance. | Requires limit switches on motors to stop them exceeding the prescribed arc and potentially causing damage to wiring and surroundings from forceful jets of water or foam. |
| | Manual override facility difficult to arrange as hydraulic actuators are not normally available with hand-wheel activation. | Manual hand-wheel on motors to provide manual override facility, adds system complexity and cost. |

water-driven Pelton wheel power pack and small movements of hydraulic fluid, this problem can be overcome. Such actuators use tiny flows of highly pressurised hydraulic fluid to efficiently activate monitor movement, so the whole monitor can be remotely operated up to 300 metres away using its hydraulic control system and water driven power pack. This type of power pack requires only connection to the pressurised water main to provide intrinsically safe monitor operation at any time, as long as the main fire pumps are activated. There is even a fail-safe facility with a manual override handle in some systems to provide enough power manually at the hydraulic power pack control point to move the monitor's position up to 300 metres away.

This avoids what some consider the best and others consider the worst of electro-hydraulic RCMs, namely relying on two power sources. With an all-hydraulic RCM system, as long as your fire main is delivering water pressure, your RCMs will continue to work and, arguably, there is less to go wrong with them, so routine maintenance should also be diminished.

## Define the Fuel Hazard

Having sorted out the required monitor design and type necessary for your situation, we can now assess the type of fuel hazard you are facing. If it is a potential gas cloud or combustible carbonaceous material, then a water jet/spray nozzle application is probably the best solution. If it is a flammable liquid hydrocarbon fuel hazard, then a non-aspirating film forming foam application through a water nozzle may be most suitable. This is particularly the case for offshore oil installations and helidecks, where wind can drift aspirated foam more easily or prevent it from reaching the target area. Such non-aspirated or semi-aspirated applications are also effective in aircraft hangars to deliver a low expansion foam blanket across the hangar floor, covering any fuel fire quickly and effectively.

Large deep-seated areas of hydrocarbon fuels in bulk storage tanks and bunded areas may require aspirated foam applications from foam cannons or semi-aspirating nozzles that draw in controlled amounts of air to the foam solution at the nozzle. This can assist with delivering a good quality foam blanket, while optimising projection distances.

## How Far will it Throw?

Many factors will affect how far a water jet can be thrown and even more factors impact on the distance different foams can be projected. Basically the tighter the group of water or foam droplets the further they will travel, as they exhibit a smaller cross sectional area to air resistance. It is possible to design a foam nozzle that will maximise throw, but it is important to ensure that the foam quality produced has sufficient stability to be capable of controlling and extinguishing the fire on arrival.

Different foam types will affect the distance travelled through foam nozzles. Generally natural protein based foams like FluoroProtein (FP), Film Forming FluoroProtein (FFFP) and their Alcohol Resistant (AR) versions are more cohesive and stick together better in a "rope" as the foam stream passes through the air, so normally travel furthest with less fall out and wastage, delivering more foam in the target area for useful firefighting duties. These foams also minimise fuel pick-up from such forceful application, providing a superior resistance against burn-back and therefore longer post-fire security.

An equivalent flow rate and pressure of synthetic detergent-based foam like Aqueous Film Forming Foam (AFFF) streaming from the same nozzle will travel less distance, because there is generally more fall out and wastage, with less foam arriving in the target area. This is because these synthetic foams are much less cohesive, so are more easily separated from the jet, giving greater air resistance and reducing the overall distance travelled. They also froth more easily, tending to make larger bubbles as they leave the nozzle and entrain more air en-route to the target area, hence travelling a shorter distance with more fall-out and a wider foam distribution pattern.

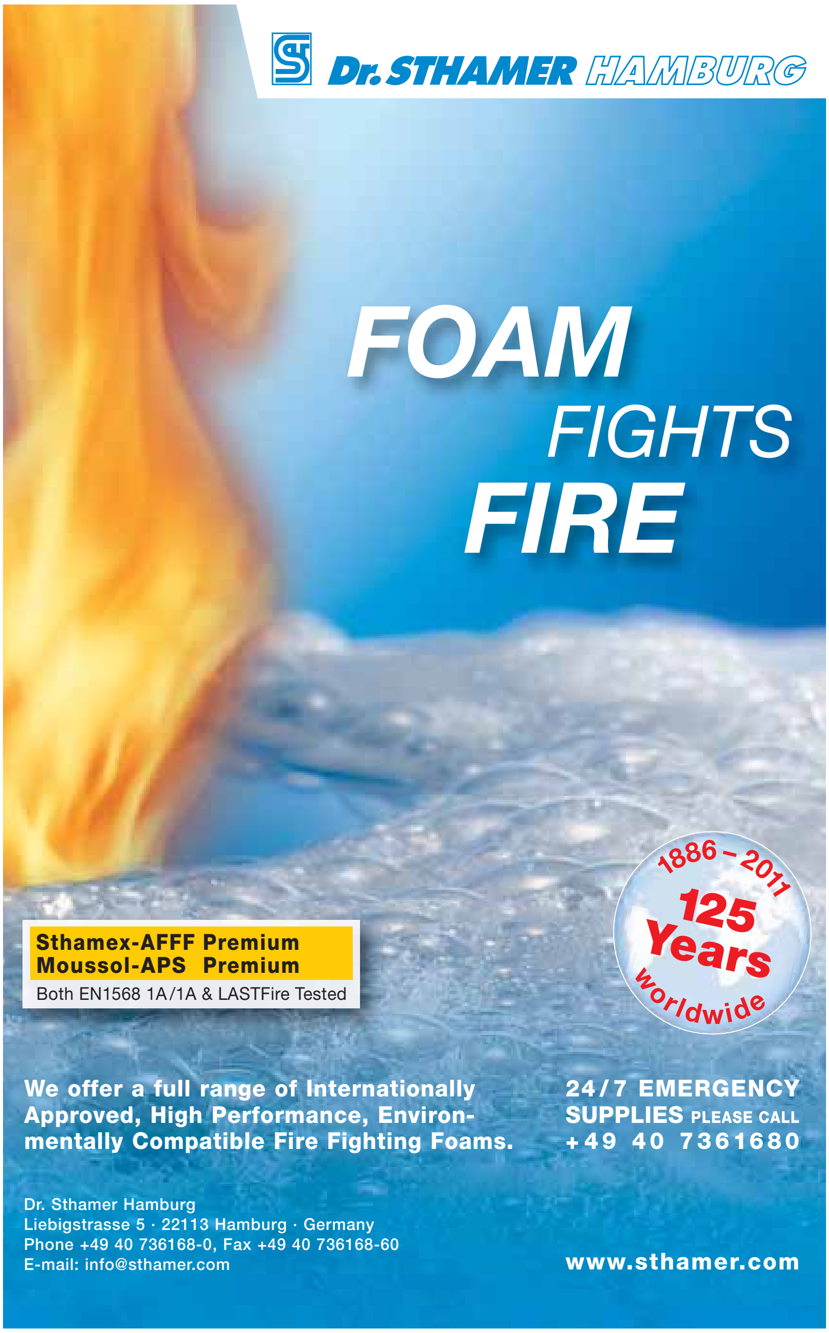
Water soluble polymers contained within high performance AR-AFFFs, and some Fluorine Free Foams (F3), could help offset some of these effects by behaving more like natural protein-based products, typically travelling less distance than modern FP/FFFP/AR-FFFP foams but further than AFFFs. However such F3 foams have no protection against fuel pick-up during such forceful application, which can lead to slow fire control, sudden flashbacks, re-ignition and rapid degradation of the foam blanket that are not overcome by higher application rates. Consequently F3 products are generally not recommended for forceful monitor applications.

The most important factor of all in monitor trajectories, whether water or foam, is the wind direction and its speed. Even a small three metres-a-second air movement against the water jet will significantly reduce the maximum throw, while a following three metres-a-second wind movement will extend the throw beyond normal expectations in still air conditions.

Consideration of all these factors should help you determine the most suitable type of firefighting monitor and foam concentrate, to suit your specific applications. **APF**

**Mike Willson** is a firefighting foam specialist at Willson Consulting

For further information, go to www.angusfire.com.au



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Fax: 62-21 719 8974
Email: sales@divemasters.co.id
Website: www.divemasters.co.id
**Dealer/Distributor**

**KOREA**

### TECKO CO LTD

2F, SK@Technopark, Mega-Dong
190-1 Sangdaewon-Dong
Sungnam-City
Kyungki-Do 462 807, Korea
Contact: Mr K Y Lee
Tel: +82 31 776 2442
Fax: +82 31 776 2444
Email: kylee@tecko.co.kr
**Dealer/Distributor**

**MALAYSIA**

### SK CRYOGENICS SDN BHD

No. 16 Jalan Anngerik Mokara 31/52
Section 31, Kota Kemuning
40460 Shah Alam, Selangor, Malaysia
Contact: Mr Steve Kellett
Tel: +60 3 5122 4269
Fax: +60 3 5122 4235
Email: steve@skcryogenics.com
**Dealer/Distributor**

**PAKISTAN**

### ALPINE INDUSTRIALCON PVT LTD

305/2 G.T. Road
Baghbanpura
Lahore, Pakistan
Contact: Mr Kashif Ahmad
Tel: +92 42 685 2313
Fax: +92 42 655 3674
Email: alpinelahore@hotmail.com
**Dealer/Distributor**

**PHILIPPINES**

### PACIFICA DIVE CENTER

2226 Chino Roces Avenue
Makati City, Philippines
Contact: Mr Torben Bohn
Tel: +632 8464 220
Fax: +632 5536 621
Email: torben@pacificadive.net
**Dealer/Distributor**

**SINGAPORE**

### BAUER COMPRESSORS ASIA PTE LTD

2 Penjuru Place
#01-05 Penjuru Tech Hub
Singapore 608783
Contact: Mr Stephen Kellett
Tel: +65 6271 6271
Fax: +65 6272 3345
Email: info@bauer-compressors.com.sg
**Bauer Subsidiary Office**

### MARINE & INDUSTRIAL COMPRESSORS

194 Pandan Loop
#05-25 Pantech Business Hub
Singapore 128383
Tel: 62540813/62506018/68737337/68733835
Fax: 62538443
Email: masmarin@singnet.com.sg
**Dealer/Distributor**

**SRI LANKA**

### HALCHEM LANKA PVT LTD

No 7, Siri Dhamma Mawatha
Colombo 10, Sri Lanka
Contact: Mr Cyril Halloluwa Managing Director
Tel: +94 11 5843213 and 5843219 (Direct)
Fax: +94 11 2674 615 and 2792 406
Email: cyril.halloluwa@halchem-lanka.com
Website: www.halchem-lanka.com
**Dealer/Distributor**

**TAIWAN**

### MING SHEN ENTERPRISE CO LTD

5, PaShih 1 Street
DanShui Town
Taipei, Taiwan 25170, Taiwan
Contact: Mr Tom Tseng
Tel: +886 (2) 2809 5789
Fax: +886 (2) 2809 6189
Email: tom@3arrow.com.tw
**Dealer/Distributor**

**THAILAND**

### BANGKOK ENGINEERING AND TECHNOLOGY CO LTD

31/59-60 Moo 6 Pracharaj Road
T. Taladkhwan
A. Muangnonthabury Nonthabury
Thailand 11000
Tel: +662 9685 378
Fax: +662 9685 379
Email: win@betco.co.th
**Dealer/Distributor**

### DIVE SUPPLY CO LTD

88/5 Patak Rd
Chalong Bay
Phuket 83130
Thailand
Tel: +66 (76) 383414
Fax: +66 (76) 281525
Email: gm@divesupply.com
**Dealer/Distributor**

### INTERSOL ENGINEERING & TECHNOLOGY PTE LTD

7/288 Moo 6, Chaengwattana Road
Bhanmai, Pakkred, Nonthaburi 11120, Thailand
Contact: Mr Nathanan
Tel: +66 2 9808754
Fax: +66 2 9808753
Email: nathanan@intersol.th.com
**Dealer/Distributor**

**VIETNAM**

### FRANCO-PACIFIC VIETNAM CO LTD

55 Ho Hao Hon Street, District 1
Ho Chi Minh City, Vietnam
Contact: Mr Colm Minogue
Tel: +84 8 836 0257
Fax: +84 8 836 1387
Email: colmminogue@francopacific.com
**Dealer/Distributor**

## BRISTOL UNIFORMS

**AUSTRALIA**

### PAC FIRE AUSTRALIA (formerly Pacific Helmets Australia)

1/28 Burnside Road, Hallmarc Business Park
Yatala Qld 4207, Australia
Tel: +61 7 3441 7100
Fax: +61 7 3441 7177
Email: sales@pacfire.com.au
Website: www.pacfire.com.au
**Dealer/Distributor**

**BANGLADESH**

### MANIK BROTHERS

Hai Mansion (3rd Floor), 9/3 Motijheel Circular Road
Dhaka – 1000, Bangladesh
Contact: Mr A K Bhowmick
Tel: +880 2 7100 589
Fax: +880 2 7100 386
Email: manikbrs@dhaka.net
**Dealer/Distributor**

**BRUNEI**

### YEN LEE FIREWELD PTE LTD

18 Penhas Road, 208182, Singapore
Tel: +65 62909890
Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
**Dealer/Distributor**

**FIJI**

### PHILLIPS & SMITH LTD

10 Akatea Road, Glendene
Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

**HONG KONG**

### CHUBB HONG KONG LTD

10/F Octa Tower, 8 Lam Chak Street
Kowloon Bay, Kowloon, Hong Kong
Contact: Simon Tsang
Tel: +852 2746 9736
Fax: +852 2627 6768
Email: simon.tsang@chubb.com.hk
Website: www.chubb.com.hk
**Dealer/Distributor**

### INDIA

**FOREMOST MARKETING PVT LTD**
M-1 Green Park Extn
New Delhi 110016 India
Contact: Mr Vinay Khanna
Tel: +91 11 261 969 82
Fax: +91 11 261 669 61
Email: foremosttechnico@gmail.com
Website: www.foremostsafety.com
**Dealer/Distributor**

### INDONESIA

**PT INSPIRAN IDEAL INDOTAMA**
Jl. Pejaten Barat No. 39, Pasar Minggu
Jakarta Selatan 12510, Indonesia
Contact: Lim Tiam Hwat
Tel: 62-21-7182472
Mobile: 62-816889164
Fax: 62-21-7182578
Email: lim@inspiran.co.id
Website: www.inspiran.co.id
**Dealer/Distributor**

### JAPAN

**ABLE-YAMAUCHI CO LTD**
Yokohama Nishiguchi, SIA Building
10-36 Kitasaiwai, 2-Chome Nishi-Ku
Yokohama 220-0004, Japan
Contact: S Yamauchi
Tel: +81 45 312 1130
Fax: +81 45 312 1350
Email: emiko@able-yamauchi.co.jp
Website: www.able.yamauchi.co.jp
**Dealer/Distributor**

### MALAYSIA

**DASAPREM (M) SDN BHD**
10 & 12 Jalan Muara 8/9
40000 Shah Alam
Selangor Darul Ehsan, Malaysia
Contact: Mr Prem R Murthy
Tel: +603 550 9060
Fax: +603 550 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com
**Dealer/Distributor**

### NEW ZEALAND

**PHILLIPS & SMITH LTD**
10 Akatea Road, Glendene, Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

### PHILIPPINES

**24 HR RESOURCES CORPORATION**
602 A San Joaquin St, Cor Sto Nino St Brgy
Plainview Mandaluyong City
1550 Metro Manila, Philippines
Contact: Raffy Alpajaro – Account Manager
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Email: sales.24hrirc@gmail.com

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Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
Website: www.fireweld.com.sg
**Dealer/Distributor**

### SRI LANKA

**FIRETECH (PRIVATE) LTD**
34 Walter Gunesekara Mawatha
Nawala, Sri Lanka
Contact: Leon Daniels
Tel: +94 11 4410588
Fax: +94 11 2806666
Email: firetech@pan.lk
**Dealer/Distributor**

### TAIWAN

**SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD**
No 222-2 Sec2, Cheng Tai Rd
Wu-Ku Shiang, Taipei, Hsien, Taiwan
Contact: Liu Yuan Hung
Tel: +886 22292 1751
Fax: +886 22291 1984
Email: sheng.tai@msa.hinet.net
Website: www.shengtai.com.tw
**Dealer/Distributor**

### VIETNAM

**TRAN VU TRADING CO LTD**
61 Ban Co Street, District 3, Hochiminh City, Viet Nam
Contact: Tran Vu Hong
Tel: +84 88325101
Fax: +84 88309586
Email: sales@tranvufire.com
Website: www.tranvufire.com
**Dealer/Distributor**

## COLTRI ASIA PACIFIC

### BEIJING AND NORTHERN CHINA

**BEIJING DEKANG TIMES SCI & TECH CO LTD**
Room 211, Building Huixinxiangyuan
No.2 Beisanhuanzhonglu, Chaoyang District, Beijing
Contact: Miss Amy
Tel: 0086-10-62356354, 62352539, 62366379
Fax: 0086-10-62366364
Email: dekangtimes@hotmail.com
Website: www.beijingdekang.com
**Dealer/Distributor**

### CHINA

**SHANGHAI PANNY TRADING CO LTD**
3F, #17-2 No.230, Xinjinqiao Rd.
Pudong new area, Shanghai
Contact: Mr Todd
Tel: +86-21-50321062
Fax: +86-21-50321063
Email: todd@coltrisub-china.com
Website: www.coltrisub-china.com
**Dealer/Distributor**

### HONG KONG

**WAH SHING COMPANY**
No. 2B-2C, G/F, Larch Street, Tai Kok Tsui
Kowloon, Hong Kong SAR
Contact: Mr Danny Kwok
Tel: +852 2391 3997, +852 2391 4084
Fax: +852 2789 4638
Email: wahshingcompany@gmail.com
**Dealer/Distributor**

### INDIA

**JYOTECH ENGG & MKTG CONSULTANTS**
Corp. HQ: B-127, Sector 65, NOIDA – 201302,
Distt Gautam Budh Nagar, U.P.
Contact: Mr Chandan Bhatia
Tel: 0120-4711300
Fax: 0120-4711317
Direct: 0120-4711304
Mobile: 09811115979
Email: chandan.bhatia@jyotech.com
Regd Office: H-49 A, Kalkaji, New Delhi 110019
**Dealer/Distributor**

### INDONESIA

**LAUTAN MAS**
Jl. Toko Tiga No. 24 Jakarta 11230 Indonesia
Tel: +62 (0) 21 690-1333
Fax: +62 (0) 21 690 2479
Email: info@lautanmas.com
Website: www.lautanmas.com
**Dealer/Distributor**

### KOREA SOUTH

**DONGJIN ENGINEERING CO LTD**
Gwansan-Don 570, Deokyang-Gu
Goyang-City, G, yunggi-Do
Contact: Mr Yoo
Tel: 82-3L-969-7286/7
Fax: 82-3t-969-728
Email: asglobal@naver.com
**Dealer/Distributor**

### JAPAN

**SHIMADA & CO LTD**
No. 4-2, Ichioka 3-Chome
Minato-Ku, Osaka, 552-0012
Tel: 81-6-6574-0908
Fax: 81-6-6575-3545
Email: shimato@shimatonet.co.jp
www.shimatonet.co.jp
**Dealer/Distributor**

### MALAYSIA

**RAINBOW RUNNER SDN BHD**
5, Ukay Boulevard, Jln Lingkaran Tengah Dua
Hulu Kelang, 68000 Ampang, Selangor
Tel: +603 4162 2837, +603 4162 3837
Fax: +603 4161 7837
Website: www.rainbowrunner.net
**Dealer/Distributor**

### MALDIVES

**COLTRI COMPRESSORS MALDIVES**
Malè, Republic Of Maldives
Contact: G.Athafaiy, Mr Luigi Scardigno
Mobile: +9607924199
Email: info@coltrisubmaldives.com
Email: service@coltrisubmaldives.com
**Dealer/Distributor**

### NEW ZEALAND

**AIR TECHNOLOGY LTD**
5/20 Constellation Drive
Mairangi Bay 0632 Auckland
PO Box 305065 Triton Plaza
North Shore, Auckland 0757, New Zealand
Contact: Ross Irvine
Tel: 64-9-478 9995
Fax: 64-9-478 6221
Website: www.divecompressors.co.nz
**Dealer/Distributor**

### SINGAPORE

**ALLROUND ADVANCED TECHNOLOGIES PTE LTD**
105 Sims Ave #03-06 Chancerlodge Complex
Singapore 387429
Tel: +65 749 2778
Fax: +65 749 2977
Email: enquiry@allround.com.sg
**Dealer/Distributor**

### TAIWAN

**NELVEN CO LTD**
16F-8, No. 400, Huan Bei Road
Zhongli city, Taoyuan county 320, Taiwan
Tel: (03) 4260860
Fax: (03) 4228179
Email: nelven@ms18.hinet.net
Website: www.nelven.com.tw
**Dealer/Distributor**

### THAILAND

**SIAM DIVING ENTERPRISES ASIA PACIFIC CO LTD**
No.12, Chaloemprakiat Ratchakan Thi 9 Road
Soi 48, Dokmai, Prawet, Bangkok, 10250, Thailand
Tel: +66 2 726-6101-5
Fax: +66 2 726-6106
Email: c.benelli@aerotecnicacoltriasiapacific.com
Email: sdesystems@csloxinfo.com
www.aerotecnicacoltriasiapacific.com
**Dealer/Distributor**

### VIETNAM

**COLTRI COMPRESSOR VIETNAM**
Address Lo 51 – 02, Hon Ro - Phuoc Dong
Nha Trang, Vietnam
Contact: Craig Anderson
Tel: +84 0914 (0) 29 790
Email: craig@coltrisubvietnam.com
Website: www.coltrisubvietnam.com
**Dealer/Distributor**

### PHILIPPINES

**DIVE SUPPLY SUBIC INC**
Office 4 & 7 EMS Building, 14th St., Subic Gate
Perimeter Road, Subic Freeport Zone
2222 Olongapo
**Dealer/Distributor**

### POINT OF SALE LOCATIONS

**AQUAVENTURE WHITETIP DIVE SUPPLY – BORACAY**
Stall 109 D' Mall D' Boracay Phase 4 Station 2
Brgy. Balabag, Malay Aklan, Boracay
Tel: (6336) 288-5615
Email: boracay@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

**AQUAVENTURE WHITETIP DIVE SUPPLY – CEBU**
Unit 14 Borromeo Arcade Bldg.
39 F Ramos Street, Cebu
Tel: (6332) 412-5561
Email: cebu@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

**AQUAVENTURE WHITETIP DIVE SUPPLY – MACTAN**
Bagumbayan 2, Maribago, Mactan Island, Lapu Lapu
Tel: (6332) 492-0122
Email: mactan@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – MAKATI

Unit 101-102 Metropolitan Terraces Condominium
Sacred Heart cor. Kamagong Streets
San Antonio Village, Makati
Tel: (+632); 519-8375; 519-8376; 846-8344
Email: makati@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – ERMITA

ERMITA1362 A. Mabini Street
Unit 101-106 Joncor II Bldg.
Ermita, Manila
Tel: (632) 708 9990
Email: ermita@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – PUERTO GALERA

Sabang Beach, Oriental Mindoro
Puerto Galera
Tel: (6343) 287-3172
Email: puertogalera@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

## Cutters Edge

FIRE RESCUE SAWS

**CHINA**

### ANCOM SYSTEMS INC

Building 5, Courtyard 10 Village, Middle Road
North 3rd Ring Road, Beijing, PR 100011
Contact: Pei Zhang
Tel: 86 10 6202 2792
Fax: 86 10 6207 7929
Email: hung.fang@utoronto.ca
Website: www.ancom.cn
**Dealer/Distributor**

### NORLAN ENTERPRISES, INC

Room 952, #218 Tang Li Road
Chao Yang District, Beijing, PR 100012
Tel: 86 10 84673721
Fax: 86 10 84673770
Email: helenwang@norlan.cn
Website: www.norlan.cn
**Dealer/Distributor**

### WUXI NEW FIRETRE SAFETECH LTD

Block 3, Long Shan Wen Bo Industrial Park
Qian Yao Road, Hu Bin District
Wuxi, Jiangsu Provence, PR 214151
Tel: 86 510 8225 5991
Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com
**Dealer/Distributor**

**HONG KONG**

### TIAN YOU INTERNATIONAL DEV CO

Room 119, International Trade Centre
11-19 Sha Tsuo Road, Tsuen Wan, Hong Kong
Contact: Philip Shek
Tel: 852 24161241
Fax: 852 24169636
Email: info@tianyou.com.hk
**Dealer/Distributor**

**INDIA**

### ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar,
Sushil Muni Square, Shankar Road
New Delhi PIN – 110 060, India
Tel: 91 11 49458800
Fax: 91 11 49458844
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**INDONESIA**

### PT MITRA TEKNIKATAMA SUPPLINDO

Jl Ekor Kuning No 1, Pasar Ikan
Penjaringan, Jakarta Utara 14440
Contact: Adelaide Sagitaria
Tel: 62 216602144
Fax: 62 216602146
Email: Adelaide@mitrateknikatama.com
**Dealer/Distributor**

**JAPAN**

### TEIKOKU SEN-I CO LTD

5-13, 2 Chome, Nihonbashi
Chuo-Ku, Tokyo 103
Contact: Mr Satoh
Tel: 81 332813026
Fax: 81 332813090
Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
**Dealer/Distributor**

**MALAYASIA**

### CITO MARKETING, SDN BHD

No 11, Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
Selangor, Darul Ehsan 47301
Contact: Abu Raihan Jaafar
Tel: 60 37311286
Fax: 60 37340583
Email: cito@po.jaring.my
**Dealer/Distributor**

### SJA TRADE & SERVICES, SDN BHD

Kelana Center, Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor, Darul Ehsan 47301
Contact: Hetty Zurin Hamdan
Tel: 60 37847400
Fax: 60 37848500
**Dealer/Distributor**

**PHILLIPINES**

### SMARTGUARD

16 Blk 47th Street Extension
Capitol Subdivision, Bacolod City
Negros Occidebtal 6100
Contact: Alberto Benedicto or Aldwin K Chua
Email: Smartguardphilippines@Yahoo.Com
**Dealer/Distributor**

**SOUTH KOREA**

### JINUTEC INTERNATIONAL DIVISION

711 Visiontop Officetel 374-4
Won-DongOsan City, Korea
Contact: Na Hae-Yul
Tel: 82 31 3758558
Fax: 82 31 3754884
Email: hyna@jinutec.com
Website: www.jinutec.com
**Dealer/Distributor**

**TAIWAN**

### ALL STRONG TRADING CO LTD

No 110 Sec. 2, Chang An E Road
7th Fl. King Isian Bldg
PO Box 46-482, Taipei
Contact: K C Huang
Tel: 886 2250 79976
Fax: 886 2250 75253
Email: allstron@ms19.hinet.net
**Dealer/Distributor**

### PACIFIC CENTURY INDUSTRIAL CO LTD

PO Box 55-719, 6F-7 No, 21, Sec 3
Min-chung East Rd
Taipei
Contact: Ming Ko
Tel: 886 2251 77217
Fax: 886 2282 78101
Email: mingko@ms16.hinet.net
**Dealer/Distributor**

## DQE

**CHINA**

### ROTTER INTERNATIONAL

Flat B, 1/F, Block 3
Yau Tong Industrial Bldg.
2 Sze Shan Street
Yau Tong, Kowloon, Hong Kong
Contact: Jacky Wong (Wong Siu Kwong), President
Tel: 852-2751 7770
Fax: 852-2756 2051
**Dealer/Distributor**

**JAPAN**

### NORMECA ASIA

Seiwa Crest Blvd.
3-19-3 Asakusabashi, Taitoku
Tokyo, Japan 111-0053
Contact: Ryo Chida, President
Tel: +81-3-5687-3899
Fax:+81-3-5687-3911
Email: oversea.normecaasia@sage.ocn.ne.jp
**Dealer/Distributor**

**SOUTH KOREA**

### KMI CONSULTING LTD

45 Pantego Hill NW
Calgary, AB T3K 0B7 Canada
Contact: Jin Park, President
Tel: 403-387-1114
Fax: 403-387-1112
Email: wangjinpark@yahoo.com
**Dealer/Distributor**

## Dräger

**AUSTRALIA**

### DRÄGER SAFETY PACIFIC PTY LTD

Axxess Corporate Park Unit 99/45
Gilby Road, Mt. Waverley, VIC 3149
Tel: +61 3 9265 5000
Fax: +61 3 9265 5095
Email: customer.service@draeger.com
Website: www.draeger.com
**Representative Office**

**CHINA**

### DRÄGER SAFETY EQUIPMENT (CHINA) CO LTD

A22, Yun An Road, B Area
Tianzhu Airport Industrial Zone
Beijing 101300
Tel: +86 10 8049 8000 Ext. 213
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Email: sales.safety.cn@draeger.com
Website: www.draeger.com
**Representative Office**

**INDONESIA**

### PT DRÄGERINDO JAYA

Beverly Antasari Building
Jl. Pangeran Antasari No.67
Unit L, Cilandak Barat
Jakarta Selatan 12430
Tel: +62 21 7513 289 or +62 81 1907 678
Fax: +62 21 7512 052
Email: Product.supportindonesia@draeger.com
Website: www.draeger.com
**Representative Office**

**JAPAN**

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3-8-1 Toyo
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Tokyo 135-0016
Tel: +81 3 4461 5111
Fax: +81 3 4461 5100
Email: sales.safety.jp@draeger.com
Website: www.draeger.com
**Representative Office**

**KOREA (SOUTH)**

### DRÄGER SAFETY ASIA (KOREA REP. OFFICE)

#8-S21 8F Garden 5 Tool
292 Munjeong-dong, Songpa-gu
Seoul, 138-962
Tel: +82 2 64 15 8222
Fax: +82 2 64 15 8223
Email: Sales.korea@draeger.com
Website: www.draeger.com
**Representative Office**

**MALAYSIA**

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No. 2 & 4, Jalan Industri USJ 1/1
Taman Perindustrian USJ 1
47600 Subang Jaya
Selangor D.E., Malaysia
Tel: +603-8022-1800
Fax: +603-8022-1900 (General & Sales)
Email: dsa.malaysia@draeger.com
Website: www.draeger.com
**Representative Office**

**SINGAPORE**

### DRÄGER SAFETY ASIA PTE LTD

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#06-03, 139950 Singapore
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Email: dsa.singapore@draeger.com
Website: www.draeger.com
**Regional Office**

**TAIWAN**

### DRÄGER SAFETY TAIWAN CO LTD
12F, Kuohua Building, 868-5
Chung Cheng Road
Chung Ho City 23586
Tel: +886 2 2223 6388
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Email: sales.taiwan@draeger.com
Website: www.draeger.com
**Representative Office**

**THAILAND**

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Website: www.draeger.com
**Representative Office**

**VIETNAM**

### DRÄGER SAFETY ASIA PTE LTD
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Fax: +84 4 37955627
Email: sales.safety.vn@draeger.com
Website: www.draeger.com
**Representative Office**

## DR STHAMER HAMBURG

**SINGAPORE**

### TETRA FIRE ENGINEERING PTE LTD
10 Ubi Crescent #05-04, Ubi Techpark
Singapore 408564
Contact: Mr T S Lee
Tel: (65) 6841 4429
Fax: (65) 6841 5267
Email: tetra@singnet.com.sg
**Dealer/Distributor**

**INDIA**

### M/S ASKA EQUIPMENTS LTD
R-482, New Rajendra Nagar
Ganga Ram Hospital Square, Shankar Road
New Delhi – 110 060 India
Contact: Mr Harsh A Garg – Director
(All India Sales)
Tel: 011 494458800
Mobile: +91 11949458844
Fax: 011 27014413
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**TAIWAN**

### PAO TAI LNTERNATIONAL ENTERPRISE LTD
No.39, Lane 177, Dahua Rd
Jhongli City, Taoyuan County 320
Taiwan (R.O.C.)
Contact: Mr Sunter Sun
Mobile: 0933-114-090
Fax: 886-3-4632376
**Dealer/Distributor**

## DUPONT FIRE EXTINGUISHANTS

**CHINA**

### DUPONT CHINA HOLDING CO LTD
Shanghai Branch Building #11
No.399 Keyuan Road
Zhangjiang Hi-Tech Park
Pudong New District
Shanghai 201203
China
Tel: 86-21-38622270
Fax: 86-21-38622460
Email: in-bae.lee@dupont.com
**Representative Office**

**INDIA**

### E.I. DUPONT INDIA PRIVATE LTD
7th Floor Tower C, DLF Cyber Greens Sector-25A
DLF City, Phase-III, Gurgaon
Haryana 122 002, India
Tel: +91 (124) 409-1818
Fax: +91 (124) 254-0889/90/91/92
Email: sumit.grover@dupont.com
**Representative Office**

**KOREA, REPUBLIC OF**

### DUPONT (KOREA) INC
Asia Tower 3F, 726 Yeoksam-dong
Kangnam-Ku, Seoul, 135-719
Korea, Republic of
Tel: +82-2-2222-5220
Email: Jeff.Kim@dupont.com
**Representative Office**

**MALAYSIA**

### DUPONT MALAYSIA SDN BHD
6th Fl, Bangunan Samudra No. 1
Jalan Kontraktor U1/14, Shah Alam
Selangor 40150, Malaysia
Tel: +60 35 567-2500
Fax: +60 35 569-2994
**Representative Office**

**SINGAPORE**

### DUPONT COMPANY (SINGAPORE) PTE LTD
1 HarbourFront Place #11-01
HarbourFront Tower One
Singapore 098633
Tel: 279-3959
Fax: 65-65863696
Email: Mun-Sin.Foong@dupont.com
**Representative Office**

## Fike

**AUSTRALIA**

### FIRE PROTECTION TECHNOLOGIES PTY LTD
Unit 1/251, Ferntree Gully Road
PO Box 75, Mt Waverley
Victoria 3149, Australia
Tel: +61 3 8542 8901
Fax: +61 3 9543 9109
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au
**Dealer/Distributor**

**BANGLADESH**

### MARS SYNDICATE
114A, New DOHS, Eastern Rd. Lane #6
Mohakhali Dhaka # 1206
Bangladesh
Contact: Ms Purabi Matin CEO/
Mr Akm Rasid Hassan Technical
Tel: +88 02-882 6893/+88 018-1922 6281
Email: marssyndicate@gmail.com
**Dealer/Distributor**

**CHINA**

### I-SAFE FIRE EQUIPMENT (TIANJIN) LTD
No.16, Chong Qing Street
Jin Nan District, Tian Jin
P.R. China
Tel: +86 22 8882 6965
Fax: +86 22 8882 6970
Email: sales@isafe-fire.com
**Dealer/Distributor**

**HONG KONG**

### THE JARDINE ENGINEERING CORPORATION LTD
5/F Tower A, Manulife Financial
223-231
Wai Yip Street
Kwun Tong, Kowloon
Hong Kong
Tel: 852 2807 4684
Fax: 852 2503 4210
Email: tommy.tam@jec.com
Website: www.jec.com
**Dealer/Distributor**

**INDIA**

### NEWAGE FIRE PROTECTION ENGINEERS
7, Champaklal Udyong Bhavan
Sion (E) Mumbai 400 022, India
Tel: +91 22 2407 7421
Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com
**Dealer/Distributor**

**INDONESIA**

### PT. KALIMUTU MITRA PERKASA
Sentra Latumenten AA#18
Jl. Raya Latumenten Kav. 50, Jakarta 11460
Tel: +62 21 5696 0197
Fax: +62 21 5696 0497
Email: suastika@kalimutu.com
**Dealer/Distributor**

### PT. KENCANA LINTAS MENTARI
Jl. Pangeran Jayakarta, 85AK
Jakarta 10730, Indonesia
Tel: +62 21 628 1933
Fax: +62 21 628 1976
Email: priyana@cbn.net.id
**Dealer/Distributor**

**KOREA**

### GM ENGINEERING & SUPERVISION CO LTD
Unit D-1209, Gwangmyeong Techno Park
#60 Haan-ro, Gwangmyeong-si
Gyeonggi-do, Korea
Tel: (82) 02-844-8588
Fax: (82) 02-846-9767
Mobile: (82) 010-5036-3123
Email: ts.jeong@gmens.co.kr
**Dealer/Distributor**

**MALAYSIA**

### FIKE ASIA PACIFIC SDN BHD
18B, 2nd Floor, Jalan Astak L U8/L
Bukit Jelutong, 40150 Shah Alam
Selangor, Malaysia
Tel: +60 3 7859 1462
Fax: +60 3 7859 1461
Email: chun-wah.leong@fike.com
Website: www.fike.com
**Representative Office**

### SUKIADA ENGINEERING SDN BHD
No. 20 Jalan Astaka L U8/L, Bukit Jelutong
40150 Shah Alam, Selangor, Malaysia
Tel: +60 3 7845 2008
Fax: +60 3 7845 6008
Email: bkwong@sukiada.com.my
Website: www.sukiada.com.my
**Dealer/Distributor**

**NEW ZEALAND**

### FIRE PROTECTION TECHNOLOGIES LTD
Unit B1, 8 Henry Rose Place, Albany 0632
North Shore, Auckland, New Zealand
Tel: +64 (09) 415 5488
Fax: +64 (09) 443 7867
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

**PAKISTAN**

### MGH ENGINEERING AND CONTROL PVT LTD
H. # 20 St., #5/A Kot Shahabdin
Shahdrah, Lahore 54950, Pakistan
Tel: +92 42 7913064
Fax: +92 42 7913064
Email: mansoorshaker@yahoo.com
Website: www.mgheng.com
**Dealer/Distributor**

**PHILIPPINES**

### FIRE SOLUTIONS INC
1028 Malaya Street, Malanday Marikina City
1805 Philippines
Tel: +63 2 371 9774
Fax: +63 2 374 3041
Email: firesolutions@skyinet.net
**Dealer/Distributor**

**SINGAPORE**

### AZCEND ASIA PTE LTD
Blk 21, Kallang Avenue #04-165
Singapore 339412
Tel: (65) 6299 0798
Fax: (65) 6299 3735
Email: Chiaw.fs@azcendasia.sg
**Dealer/Distributor**

**SRI LANKA**

### BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD
122, Dawson Street, Colombo 02
Sri Lanka
Tel: +94 11 4717 500
Fax: +94 11 245 4653
Email: bldserv@sltnet.lk
**Dealer/Distributor**

**TAIWAN**

### SUNMORN INC
7F.-2, 76, Nan Jing W. Road
Taipei 10352, Taiwan
Tel: +886 2 2550 3500
Fax: +886 2 2550 5350
Email: merylyu@sunmoreinc.com
Website: www.sunmoreinc.com
**Dealer/Distributor**

**THAILAND**

### ANTI-FIRE CO LTD
316-316/1, Sukhumvit 22 Road
Klongtoey, Bangkok 10110, Thailand
Tel: +66 2 260 4565
Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com
**Dealer/Distributor**

**VIETNAM**

### EUROPEAN TECH JSC
No. 50, 218/27, Lac Long Quan Street
Tay Ho Dist., Hanoi, Vietnam
Tel: +84 4 3755 7179
Fax: +84 4 3755 7178
Email: mscee@vnn.vn
**Dealer/Distributor**

## FIRE FIGHTING ENTERPRISES

**AUSTRALIA**

### AMPAC TECHNOLOGY PTY LTD
7 Ledgar Road, Balcatta
Western Australia 6021
Tel: +618 9242 3333
Fax: +618 9242 3334
Website: www.ampac.net
**Dealer/Distributor**

**KOREA**

### HI MAX CO LTD
Sicox Tower, 115-Ho 513-14
Sangdaewon-Dong
Jungwon-Gu, Sungnam-City
Kyungki Do, Korea
Tel: +82 31 769 7698
**Dealer/Distributor**

**NEW ZEALAND**

### AMPAC INDUSTRIES LTD
PO Box 100-149
North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072
Fax: +64 94438073
**Dealer/Distributor**

**SINGAPORE**

### ACCLAIM SYSTEMS PTE LTD
Blk 104, Boon Keng Road, 05-01
Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
**Dealer/Distributor**

### ALARM SUPPLY PTE LTD
63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
**Dealer/Distributor**

**TAIWAN**

### HORING LIH IND CO LTD
4f No 18 Lane 327 Chung Shan Road
Sec 2, Chung-Ho-City
Taipei Hsien, Taiwan
Tel: +886 2224 87599
Fax: +886 2224 07752
**Dealer/Distributor**

**THAILAND**

### TEEYA MASTER SYSTS CO LTD
100/101-102 Vongvanji, Building B, 30th Flr
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: +662 2 6451130
Fax: +662 2 2488540
**Dealer/Distributor**

## FLIR SYSTEMS CO LTD

**HONG KONG**

### FLIR SYSTEMS CO LTD
Rm 1613-16, 16/F Tower 2, Grand Central Plaza
No 138 Shatin Rural Commitee Road
Shatin, New Territories, Hong Kong
Tel: +852 2792 8955
Fax: +852 2792 8952
Email: flir@flir.com.hk
Website: www.flir.com
**Representative Office**

## HD FIRE PROTECT PVT LTD

**AUSTRALIA**

### HD FIRE PROTECT PTY LTD
58/37, Slobodian Avenue, Eight Mile Plains
QLD – 4113, Australia
Tel: +61 433 194 344
Email: pacific@hdfire.com
**Representative Office**

**INDIA**

### HD FIRE PROTECT PVT LTD
C-36, Nandanvan Industrial Estate
Lal Bahadur Shastri Marg
Opposite ACC Research Centre
Thane, Mumbai, Maharashtra 400604, India
Tel: +91 22 2582 6958
Email: info@hdfire.com
Website: www.hdfire.com
**Representative Office**

**INDONESIA**

### PT. TRIMITA WUJUD REKANUSA
Jl. Gunung Sahari Raya 51/8
Jakarta Pusat 10610, Indonesia
Tel: +62 21 4227632
Email: exports@hdfire.com
**Dealer/Distributor**

## HOLMATRO

**AUSTRALIA**

### CHUBB FIRE & SECURITY
149-155 Milton St Ashfield
NSW 2131 Australia
Tel: +61 392 649 796
Email: Joan.Lambert@chubb.com.au
Website: http://www.chubb.com.au
**Dealer/Distributor**

**BANGLADESH**

### SPERRY INTERNATIONAL
5/5 Block-A, 1st Floor
Iqbal Road Mohammedpur Dhaka-1207
Bangladesh
Tel: +88 029 110 264
Email: SMNazrul@sam-sperry.com
Website: http://www.sam-sperry.com
**Dealer/Distributor**

**BHUTAN**

### TCD TRADER
PO Box 792 Changjalu, Thimphu Bhutan
Tel: +975 178 328 53
Email: TDorji212@gmail.com
Website: http://www.tcdtrader.com
**Dealer/Distributor**

**BRUNEI**

### IECS
8A Simpang 558
Jalan Pasir Kampong Berakas BB1314 Brunei
Darussalam
Tel: +673 877 79 68
Email: IECS.Brunei@gmail.com
**Dealer/Distributor**

**CAMBODIA**

### FIRESAFE CAMBODIA
165 Sotheros blvd
Phnom Penh Cambodia
Tel: +855 12 380 211
Email: Paul@firesafecambodia.com
Website: http://www.firesafecambodia.com
**Dealer/Distributor**

**CHINA**

### HOLMATRO CHINA
No 1801, Pangjin Road
Wujiang ETDC 215200 Suzhou
China
Tel: +86 512 6380 7060
Email: China@holmatro.com
Website: http://www.holmatro-china.com
**Representative Office**

**FIJI**

### PIONEER SUPPLIES
161 Toorak Road Suva Fiji Islands
Tel: +679 331 27 37
Email: Mahesh@pio-sup.com
Website: http://www.pio-sup.com
**Dealer/Distributor**

**HONG KONG**

### ABLESLINK COMPANY
Unit B4, 2/f., Block B
Sheung Shui Pl.
3 Ka Fu Close Sheung Shui
New Territories Hong Kong
Tel: +852 2466 4568
Email: Ableslink@yahoo.com
**Dealer/Distributor**

**INDIA**

### RESQ TECHNOLOGIES
C-202, Shilalekh Opp.
Police Stadium Shahibag
Ahmedabad - 380 004 India
Tel: +91 942 731 01 59
Email: RESQ.Technologies@gmail.com
Website: http://www.resqtechnologies.com
**Dealer/Distributor**

**INDONESIA**

### ESA KARYA MANDIRI
Jl. Danau Sunter Utara Kav. 60
Rukan Sunter Terrace Blok
C22 Jakarta 14350 Indonesia
Tel: +62 212 946 15 39
Email: EsaKarya@cbn.net.id
**Dealer/Distributor**

**JAPAN**

### AKAO
Shin-machi 4-13-1 Nishi-ku Osaka-fu
550-0013 Japan
Tel: +81 66 532 4131
Email: eigyo@akao-co.co.jp
Website: http://www.akao-co.co.jp
**Dealer/Distributor**

**KOREA**

### KYUNG JIN INTERNATIONAL
Kyung Jin B/D. 118-58 Yongdoo-dong
Dongdaemun-gu, Seoul Korea
Tel: +82 22 38 21 86
Email: info@kyungjinltd.com
Website: http://www.kyungjinltd.com
**Dealer/Distributor**

**MACAU**

### TCT TRI-CONTINENTAL TRADING
4/F-E, Dynasty Plaza Bldg.
411-417 Ald. Dr. C.
D'Assumpção Macau Macau
Tel: +853 7500 08
Email: TCT@macau.ctm.net
**Dealer/Distributor**

**MALAYSIA**

### PANDAN NIAGA
No81A, Jalan tabla 33/21
Shah Alam Techn. p
Seksyen 33 Shah Alam Selangor
Darul Ehsan 40400 Malaysia
Tel: +60 351 221 310
Email: PNSB@pn.com.my
Website: http://www.pn.com.my
**Dealer/Distributor**

**MONGOLIA**

### NANOPLANET

House #3, 6th Khoroo, 10th Khoroolol
Bayangol District Ulaanbaatar 16081 Mongolia
Tel: +976 88 09 66 48
Email: info@planet-mongolia.com
Website: http://www.nano.planet-mongolia.com
**Dealer/Distributor**

**NEW ZEALAND**

### CHUBB FIRE & SAFETY PRODUCTS

3 Fisher Crescent (Private Bag 92207)
Mt Wellington Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: http://www.chubb.co.nz
**Dealer/Distributor**

**PAKISTAN**

### HASEEN HABIB TRADING

7, Shaheen View, Block 6
PECHS Main Shahrae Faisal
Karachi Pakistan
Tel: +92 213 452 62 40
Email: FBarry@haseenhabib.com
Website: http://www.haseenhabib.com
**Dealer/Distributor**

**PHILIPPINES**

### WALLGREEN INDUSTRIAL VENTURES CORP

62 West Avenue Quezon City 1104 Philippines
Tel: +63 241 108 18
Email: WIVCOR@yahoo.com
**Dealer/Distributor**

**SINGAPORE**

### ADVENTRA

48 Changi South St. 1 486130 Singapore
Singapore
Tel: +65 689 822 83
Email: PK.Tan@adventra.com.sg
Website: http://www.adventra.com.sg
**Dealer/Distributor**

**SRI LANKA**

### HALCHEM LANKA

No.07, Siri Dhamma Mawatha Colombo 10 Sri Lanka
Tel: +94 112 677 941
Email: inquiries@halchem.net
Website: http://www.halchem.net
**Dealer/Distributor**

**TAIWAN**

### PARKSON TRADING

3F No. 50, Huaning Road, Guo-Shan Dis. 80471
Kaohshiung City Taiwan
Tel: +886 75 52 16 50
Email: PTCKPeng@parkson.com.tw
**Dealer/Distributor**

**THAILAND**

### CHASE ENTERPRISE (SIAM)

497 Prapinklao Road, Bangyeekhan, Bangplad
Bangkok 10700 Thailand
Tel: +66 281 940 00
Email: ChaseSiam@chasesiam.com
Website: http://www.chasesiam.com
**Dealer/Distributor**

**VIETNAM**

### WETEC TECHNOLOGY EQUIPMENT

10th Floor, 9 Lang Ha
Ba Dinh District Hanoi Vietnam
Tel: +84 945 582 626
Email: Khoa.TD@wetec.vn
Website: http://www.wetec.vn
**Dealer/Distributor**

## K.V. FIRE CHEMICALS (INDIA) PVT LTD

**INDIA**

Kamala Niwas, Plot No. 32
Lane D, Sector-8, Vashi
Navi Mumbai-400703, Maharashtra, India
Tel: +91 22 27820827
Fax: +91 22 27824712
Email: export@kvfire.com
Website: www.kvfire.com
**Representative Office**

## LHD GROUP

**AUSTRALIA**

### LHD GROUP AUSTRALIA P/L

Unit 3, 15 Dunstan Road, Wingfield
South Australia, 5013, Australia
Tel: (+61) 8 8139 7777
Fax: (+61) 8 8139 7788
Email: lionasia@lionapparel.com
Website: www.lhd-group.com
**Representative Office**

**HONG KONG**

### LHD GROUP HONG KONG LTD

Tins Centre Blk. 3, No. 3 Hung Cheung Road, 10/F
Unit 1003/1004, Tuen Mun, N.T., Hong Kong
Tel: (+852) 2463 2982
Fax: (+852) 2463 2770
Email: totalcarehk@lionapparel.com
Website: www.lhd-group.com
**Representative Office**

## MSA

**AUSTRALIA**

### MSA AUSTRALIA

137 Gilba Road, PO Box 43, Wentworthville
Sydney Girraween N.S.W. 2145 Australia
Tel: +61 2 9688 0333
**Representative Office**

**CHINA**

### MSA CHINA (SHANGHAI)

Room 405-407, Aetna Tower, 107 Zunyi Road
Shanghai 200051 China
Tel: +86 21 62375878
**Representative Office**

### MSA CHINA (SUZHOU)

No. 8 Rui En Lane, Xingpu Road,
Suzhou Industrial Park, Jiangsu Province China
Tel: +86 512 6289 8880
**Representative Office**

### MSA HONG KONG

25th Floor, Jupiter Tower, No. 9 Jupiter Street
Hong Kong
Tel: +852 2258 7588
**Representative Office**

**INDONESIA**

### MSA INDONESIA

Kompleks Multiguna Kemayoran No. 1-K, Jl
Rajawali Selatan Raya Blok C5 No. 2
Jakarta 14410, Indonesia
Tel: +62 [21] 640 9000
**Representative Office**

**JAPAN**

### MSA JAPAN

30-16, Nishiwaseda 3-chome
165-0051 Shinjuku-ku, Tokyo Japan
Tel: +81 3 3209 2171
**Representative Office**

**MALAYSIA**

### MSA MALAYSIA

No.5, Jalan P4/8A, Crest Hill Industrial Park
Bandar Teknologi Kajang
43500 Semenyih, Selango Malaysia
Tel: +60 3 8724 8208
**Representative Office**

**NEW ZEALAND**

### MSA NEW ZEALAND

The Gate, Unit E, 373 Neilson Street
Auckland New Zealand
Tel: 0800 441 335
**Representative Office**

**SINGAPORE**

### MSA S.E. ASIA

51 Ayer Rajah Crescent, Singapore 139948
Tel: +65 6776 1633
**Representative Office**

**THAILAND**

### MSA THAILAND

19/59 (Unit D4) Moo 10, Phahon
Yothin Road, 43 km, Tambon Khlong
Nueng, Amphur Khlong Luang
Pathum Thanee 12120 Thailand
Tel: +66 0 2500 6111
**Representative Office**

**AUSTRALIA**

### PAC FIRE AUSTRALIA

1/28 Burnside Road, Hallmarc Business Park
Yatala, QLD 4207, Australia
Tel: +61 7 3441 7100
Fax: +61 7 3441 7177
Email: sales@pacfire.com.au
Website: www.pacfire.com.au
**Dealer/Distributor**

**NEW ZEALAND AND ASIA-PACIFIC**
***(Excluding Australia)***

### PACIFIC HELMETS (NZ) LTD

PO Box 866, 315 Heads Road
Wanganui 4501, New Zealand
Tel: +64-6-344-5019
Fax: +64-6-344-5376
Email: sales@pacifichelmets.com
Website: www.pacifichelmets.com
**Manufacturer/Distributor**

## SCOTT SAFETY

**AUSTRALIA**

137 McCredie Road
Guildford, NSW 2161, Australia
Contact: Peter Richards
Mobile: 0419 020 374
Tel: +61 2 8718 2029
Email: prichards@tycoint.com
Website: www.scottsafety.com
**Representative Office**

**NEW ZEALAND**

6 Portage Road, New Lynn
Auckland, New Zealand
Tel: +64 (9) 826 1716
Fax: +64 (9) 827 2288
Email: scott.sales.anz@tycoint.com
Website: www.scottsafety.com
**Representative Office**

**AUSTRALIA**

### GAAM EMERGENCY PRODUCTS

29 Temple Dr., PO Box 211
Thomastown, Victoria 3074, Australia
Tel: +61 3 9464 8400
Email: iprice@tycoint.com
Website: www.gaam.com.au
**Dealer/Distributor**

**BRUNEI**

### S.K. ROSENBAUER PTE LTD

8 Tuas Drive 2, Singapore, 638643, Singapore
Tel: (+65) 6862 3155
Email: tony.lim@skrosenbauer.com
Website: www.skrosenbauer.com
**Dealer/Distributor**

**CHINA**

### TASK FORCE TIPS INC

3701 Innovation Way
Valparaiso, IN 46383-9327
United States of America
Tel: 1 219 548 4000
Email: john.donnelly@tft.com
Website: www.tft.com
**Head Office**

**HONG KONG**

### ROTTER INTERNATIONAL LTD
Flat B 1/F Block 3, Kowloon
Hong Kong
Tel: (852) 2751 7770
Email: jacky@rotter.com.hk
Website: rotter.com.hk
**Dealer/Distributor**

**INDIA**

### FOREMOST TECHNICO PVT LTD
M-1, Green Park Extension
New Delhi 110016, India
Tel: +91 (11) 2619 6982
Email: foremosttechnico@gmail.com
Website: www.foremost-india.com
**Dealer/Distributor**

**INDONESIA**

### PT PALMAS ENTRACO
JL. K.H. Samanhudi No. 85
Jakarta Pusat, 10710
Tel: +62 (21) 384 1681
Email: sales@palmas.co.id
Website: www.palmas.co.id
**Dealer/Distributor**

**JAPAN**

### YONE CORPORATION
23, Nishinakaai-Cho, Nishinokyo
Nakagyo-Ku, Kyoto 604, Japan
Tel: +81 (7) 582-11185
Email: t.yone@myad.jp
Website: www.yone-co.co.jp
**Dealer/Distributor**

**KOREA (SOUTH)**

### SHILLA FIRE CO LTD
433-11 Non Hon-Dong
Nam Dong-Gu
Inchon City 405-300
South Korea
Tel: +82-02-3665 9011
Email: kofire77@hotmail.com
Website: www.firekorea.com
**Dealer/Distributor**

**MALAYSIA**

### SENTRIX TECHNOLOGY SDN BHD
No. 22, Jalan TP 3/1
Taman Perindustrian Sime UEP
47620 Subang Jaya
Selangor Darul Ehsan
Malaysia
Tel: +603 8023-5228
Email: chong@sentrix.com.my
Website: www.sentrix.com
**Dealer/Distributor**

**MYANMAR**

### TASK FORCE TIPS INC
3701 Innovation Way, Valparaiso
IN 46383-9327, United States of America
Tel: 1 219 548 4000
Email: john.donnelly@tft.com
Website: www.tft.com
**Head Office**

**NEW ZEALAND**

### WORMALD (TYCO SAFETY PRODUCTS)
6 Portage Road, New Lynn Auckland 0600
New Zealand
Tel: +64 9 826 1716
Email: sgurnick@tycoint.com
Website: www.wormald.co.nz
**Dealer/Distributor**

**PAKISTAN**

### PAKISTAN VEHICLE ENGINEERING
D-134, S.I.T.E., Karachi
Pakistan – 75700
Tel: 0092-21-32571426
Email: info@pve.com.pk
Website: www.pve.com.pk
**Dealer/Distributor**

**PAPUA NEW GUINEA**

### TASK FORCE TIPS INC
3701 Innovation Way
Valparaiso, IN 46383-9327
United States of America
Tel: 1 219 548 4000
Email: john.donnelly@tft.com
Website: www.tft.com
**Representative Office**

**PHILIPPINES**

### ALLIANCE INDUSTRIAL SALES
Unit 4, Finlandia Town Homes
#1700 Dian, cor. Finlandia Street
Brgy, San Isidro, 1234 Makati City
Philippines
Tel: +63 2 7561 749
Email: alliance8@pldtdsl.net
**Dealer/Distributor**

**SINGAPORE**

### S.K. ROSENBAUER PTE LTD
8 Tuas Drive 2, Singapore 638643
Singapore
Tel: +65 6862 3155
Email: tony.lim@skrosenbauer.com
Website: www.skrosenbauer.com
**Dealer/Distributor**

**TAIWAN**

### TASK FORCE TIPS INC
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Back Issues: US $18.00, £10.00 or €15 each inclusive of P&P (subject to availability)

**MDM Publishing Ltd.**
The Abbey Manor Business Centre, The Abbey,
Preston Road, Yeovil, Somerset BA20 2EN,
United Kingdom
Tel: +44 (0) 1935 426 428
Fax: +44 (0) 1935 426 926
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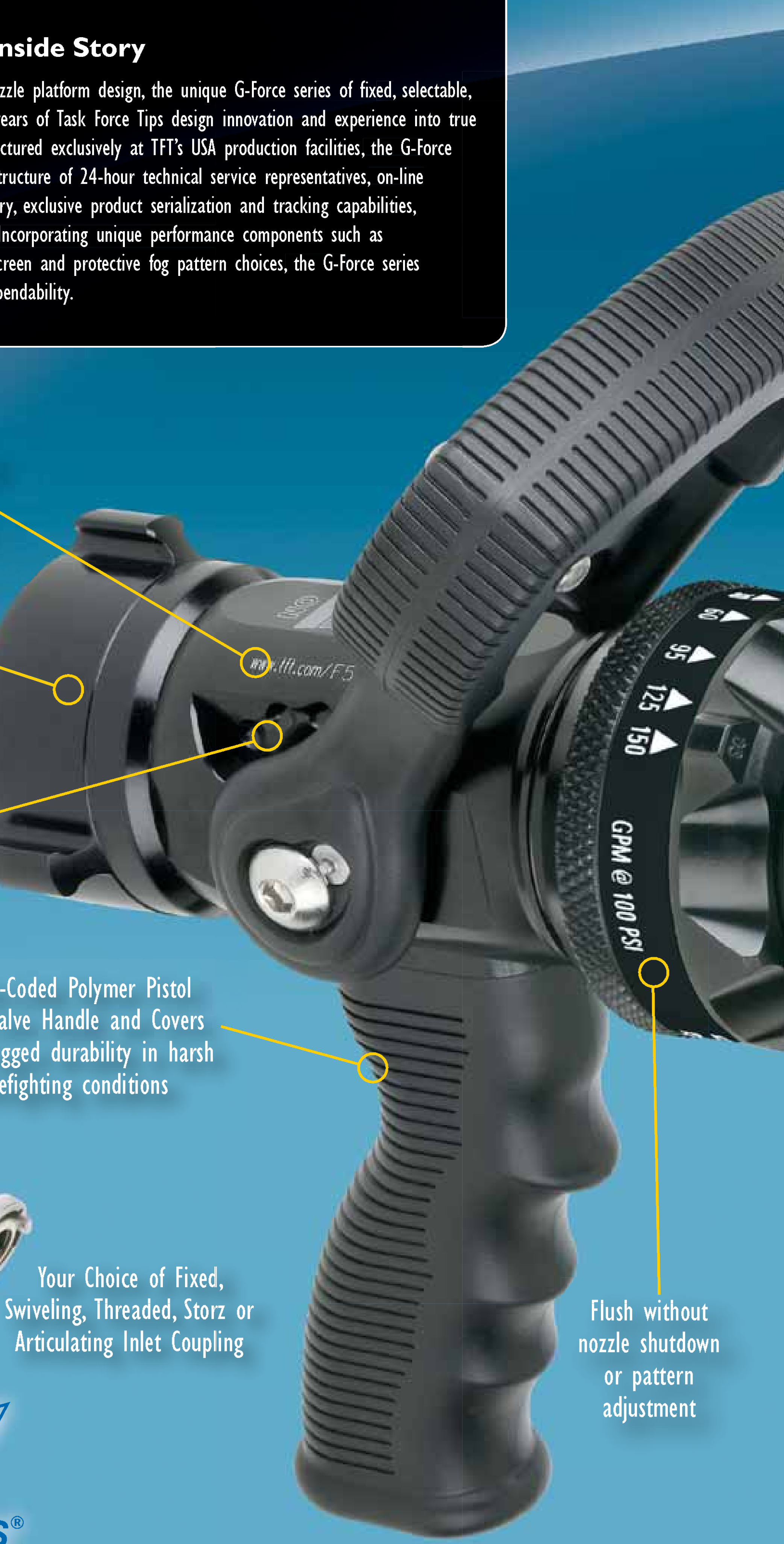
# ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

## G-Force Nozzles: The Inside Story

Based on a highly customizable global nozzle platform design, the unique G-Force series of fixed, selectable, and automatic nozzles combine over 40 years of Task Force Tips design innovation and experience into true next generation firefighting tools. Manufactured exclusively at TFT's USA production facilities, the G-Force series is supported by an extensive infrastructure of 24-hour technical service representatives, on-line documentation, digital video training library, exclusive product serialization and tracking capabilities, and a proven 5 year product warranty. Incorporating unique performance components such as a stainless steel slide valve, inlet debris screen and protective fog pattern choices, the G-Force series delivers high performance and rugged dependability.



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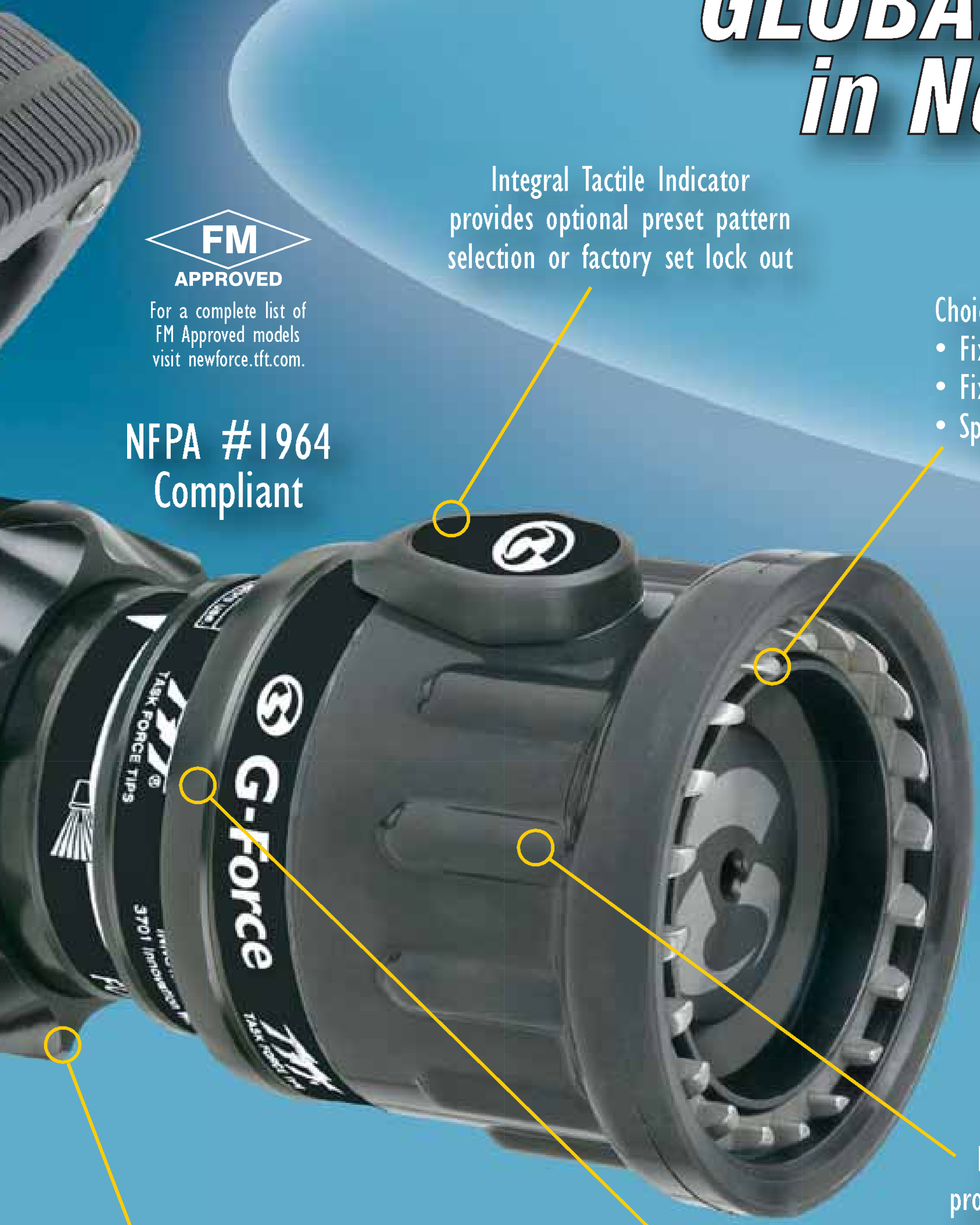

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APF
An MDM PUBLICATION
Issue 47 – September 2013
www.mdmpublishing.com
ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Front cover: Under a protective fog pattern, this firefighter is shutting a valve during pressurized fuel fire training.

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APF is published quarterly by:
MDM Publishing Ltd
The Abbey Manor Business Centre,
The Abbey, Preston Road, Yeovil,
Somerset BA20 2EN, United Kingdom
Tel: +44 (0) 1935 426 428
Fax: +44 (0) 1935 426 926
Email: mark.seton@apfmag.com
Website: www.mdmpublishing.com

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**Subscriptions:** For your free subscription, please register at **www.mdmpublishing.com**

ISSN – 1476-1386

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Page design by Dorchester Typesetting Group Ltd
Printed in the UK

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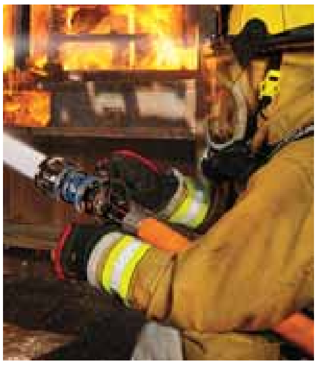
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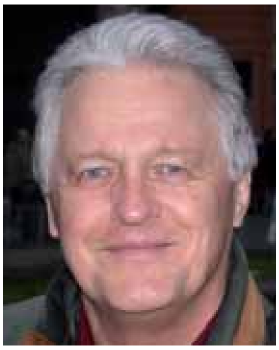

**Graham Collins**

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# Let’s Work Together

Natural disasters continue to be hitting us with greater frequency and ferocity and, increasingly, scientists around the world are pointing an ever-more collective finger of blame at climate change, so surely now is the time to redouble our efforts to work together to overcome the challenges of fires, floods and storms.

Not for the first time in this magazine’s *From the Editor* page am I banging the drum about what I see as the need for all concerned to face up to the very real prospect of continuing natural disasters and the potential severity of their impact in the Asia Pacific region. So I wholehearted applaud the work being done by Bushfire CRC in Australia, my adopted home, to raise awareness, and I particularly welcome Professor Barbara Norman’s article that appears in this edition of *Asia Pacific Fire*.

If we are to avoid the worst that nature can throw at us, we all have a role to play; it is not down to somebody else. Politicians, both local and national, planning authorities, town planners, developers, architects, builders, utility companies, the money men – even the guy in the street – have to shoulder their share of responsibility. Those old enough to recall the 1970s rock group, Canned Heat, might do well to recall the title of their hit song, *Let’s Work Together*, because that is what it is all about; working together, with a shared agenda. Take a look at the lyrics online; they could have been written for the climate challenges we face today.

**If we are to avoid the worst that nature can throw at us, we all have a role to play; it is not down to somebody else. We all have to shoulder our share of the responsibility.**

Personally, I believe that a prerequisite to this is the need to stop concerning ourselves with ping-pong argument and counter-argument about whether climate change is naturally occurring or man-made. That is for others to ponder, and is a different debate entirely. The reality is that climate change is having an adverse impact and we have to plan for it and deal with it. We should not allow the sceptics or those with ulterior vested interests or self-interest to use the natural/man-made dialogue as an all too convenient reason for doing nothing.

But this plea for working together is not limited to any one specific country; we have to work together across national borders. With this in mind, I was heartened to learn recently from AFAC (Australasian Fire & Emergency Services Authorities Council) that an inaugural strategic alliance meeting had been held in July between Pacific Islands National Disaster Management Offices, Fire and Emergency Services and Police. It came about as a result of the work undertaken by the Secretariat for the Pacific Community, the Pacific Islands Fire Services Association and AFAC, with the aim of strengthening disaster and emergency preparedness and response throughout the region.

The purpose of the meeting was given as being to: “… examine a common ‘doctrine’ to improve the inter-operability of emergency services providers, and provide an opportunity for disaster and emergency service leaders to meet and build relationships to improve their collaboration and so strengthen national and regional capacities in relation to integrated disaster preparedness and response coordination.”

I feel this is precisely what individual countries, regions, indeed the world should be doing. We should share our knowledge, experience and lessons we have learnt; be prepared to be there for one another when disaster strikes; and share resources with countries and peoples less fortunate and less well equipped to respond. Natural disasters are a huge global challenge that is not going to go away any time soon. We either have to live or die with the consequence of inaction or…. well, work together. APF

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**James M. Shannon**

NFPA

# Global View

In recent months, international news media has brought us a series of stories from garment factories in Bangladesh and Pakistan; incidents that have claimed the lives of at least 1,500 workers. It is time to join together to improve worker safety worldwide.

Last September in Karachi, the largest and most populous metropolitan city of Pakistan, a boiler explosion in a factory owned by Ali Enterprises led to a fire that killed 289 people. Exit doors were locked and windows were barred, and many workers suffocated or were killed in the crush as people tried to find a way out. The same day in Lahore, the capital of the Pakistani province of Punjab, 25 people were killed in a fire in a shoe factory where there were inadequate exits.

In November 2012, a fire broke out in the Tazreen Fashion factory outside of Dhaka, the capital city of Bangladesh. Large amounts of fabrics and yarn led to a rapid fire spread. As with the fires in Pakistan, the building's exits were inadequate and, in desperation, some workers leapt from the higher floors to their deaths. Others suffocated or burned to death. More than 100 people died in that fire.

While the enormous loss of life from these incidents reminded us of the horrible and archaic working conditions that exist in many parts of the world, no one could have envisioned what was to come. In April, the Rana Plaza Factory, an eight-story commercial building, also located outside Dhaka, simply collapsed with thousands of workers inside. The world watched as attempts were made to rescue people trapped in a nightmare of twisted rebar and shattered concrete. In the end, tragically 1127 died and another 2,500 people were injured.

It is appalling in the 21st century that workers anywhere in the world would be subjected to conditions like these. As an organisation whose mission is safety, we should ask ourselves the question NFPA has always asked when tragedies like these have occurred: What can we do to prevent them from happening again? Our own history provides the answer.

After the Triangle Waist Co. fire in New York in 1911 took the lives of 146 people, most of them garment workers, NFPA led the way in upgrading working conditions in the United States by developing the Building Exits Code, which has evolved into NFPA 101, Life Safety Code. As an organisation that is regarded as a worldwide authority on safety, we must contribute to the effort to raise standards of safety for workers everywhere.

Our policy is to make our codes and standards available on a royalty-free basis for governments of countries that wish to translate them and adopt or use them as national standards. Adoption of NFPA 1, Fire Code, and the Life Safety Code by the governments of Pakistan and Bangladesh is a way for those countries to begin to raise safety standards for their work force. NFPA stands ready to provide technical assistance in that process.

**Our policy is to make our codes and standards available on a royalty-free basis for governments of countries that wish to translate them and adopt or use them as national standards. Adoption of NFPA 1, Fire Code, and the Life Safety Code by the governments of Pakistan and Bangladesh is a way for those countries to begin to raise safety standards for their work force.**

To be realistic about this, however, we also believe that safety standards for garment factories will only improve when their customers, including the owners of the major American clothing brands, require that safety standards for workers be improved and maintained. We encourage them to join with us in the effort to improve working conditions in Bangladesh, Pakistan, and other countries that need these kinds of jobs to improve living standards for their people. Those countries can develop economically and provide for worker safety. A hundred years of experience in the United States shows that it can be done. APF

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**James M. Shannon** is NFPA's President and CEO

For further information, go to www.nfpa.org

# New ARFF Vehicles for PNG

OSHKOSH AIRPORT PRODUCTS GROUP has delivered three Oshkosh Striker 4 x 4 aircraft rescue and firefighting (ARFF) vehicles to Papua New Guinea's National Airports Corporation, which owns and operates 22 national airports across the country. The new vehicles are on duty at Jacksons International Airport – also known as Port Moresby Airport – the country's largest and busiest airport.

According to Oshkosh, the Striker 4 x 4 offers: "advanced safety systems and delivers innovative fire suppression technology, unmatched chassis performance, and unsurpassed reliability and durability". The all- wheel-drive axle configuration, with Oshkosh TAK-4 all-wheel independent suspension, offers "a smooth ride and excellent off-road capabilities". One of the Papua New Guinea Striker vehicles features a Snozzle high reach extendable turret for faster and more effective fire response.

**For more information, go to www.oshkoshairport.com**

# Glove Offers Improved Protection

The latest innovation from ROSENBAUER in the personal protection area is the Safe Grip III operational glove – an advance on the Safe Grip II, offering improved protection characteristics, optimised wearer comfort and an attractive design.

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A new feature of the Safe Grip III is the reinforcement material on the palm. This consists of a special carbon/silicone coating with a mineral component admixture, which lends the glove both enhanced mechanical characteristics and improved penetration and cut resistance. Safe Grip III improves the adhesion to very smooth and wet surfaces, plus innovative reinforcement on the palm provides a precise sense of touch.

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# New Slim-line Panther

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It has a new 700hp (Euro 5) Volvo engine that provides the Panther S with the same power as the Panther CA05 6x6 and is also equipped with an Allison twin-disc gearbox. It accelerates slightly faster than the broader CA-05 to the 80 kilometres-an-hour required by the ICAO. The "S" offers a top speed of around 120 kilometres-an-hour and with Kessler axles with individual suspension using helical coils, single tires and a choice of drum or disc brakes has the same chassis components as other Panthers. In combination with the torsion-resistant box frame and a low centre of gravity, these features provide the Panther S with what Rosenbauer describes as optimum handling characteristics that are extended to rough terrain by means of permanent all-wheel-drive.

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**For more information, go to www.ulfirefightersafety.com**

# Explosion-Proof Sounders & Loudspeakers

E2S has unveiled its new GNExS1 (117db at one metre) and GNExS2 (123db at one metre) explosion-proof horns and loudspeakers. Manufactured from lightweight and cost effective glass-reinforced polyester (GRP), the GNEx family is being heralded as offering outstanding corrosion resistance for use in the harshest environments both offshore and onshore.

Both models offer a choice of 45 different alarm tones, including those that meet the PFEER (Prevention of Fire and Explosion and Emergency Response) regulations, and a second or third tone can be selected using additional control wires giving the versatility of multiple tones from a single unit at a lower cost. The 15 watt GNExL1 and 25 watt GNExL2 loudspeakers are available in 8 Ohm, 16 Ohm and 100V Line versions. In/Out terminals eliminate the need for additional junction boxes in multiple device installations.

The units are launched with ATEX and IECEx approvals; other approvals such as UL, GOST R and InMetro will, according to e2s, follow soon. The GNEx S1 sounder has a certified temperature range of –60°C to +50°C at Ex d IIC T4, with extended temperature range of plus 70°C at IIB T4 so it can be installed in almost all Zone 1 (Cat 2G) and Zone 2 (Cat 3G) areas.

A key feature of the new design is that the flame paths use a large screw thread instead of the usual spigot joint, making it much easier to disassemble, saving time and money during installation. The standard colour for all GNEx products is red; other colours are available as an option as are alternative options on thread entries in place of the standard 2 x M20.

**For more information, go to www.e2s.com**

# Malaysian Approval

ADVANCED has recently received Malaysian Fire and Rescue Department BOMBA approval – a requirement of all fire systems in Malaysia – for its analogue addressable Axis EN fire system and ExGo extinguishing control range.

The Axis EN fire system also has approvals such as EN54, VdS2095 and is sold in over 60 territories worldwide. It is also one of the few systems to already comply with the EUROPEAN EN54 Part 13 standard.

**For more information, go to www.advancedco.com**

# Building Code "First"

Following changes in the Building Code for Australia (BCA), FUSION ADVANCED believes it is the first fire systems supplier in Australia to have its entire product range approved to the latest standards required by the BCA. All of its products are certified to JAS-ANZ standards by SAI Global, including the latest AS4428.3 2010 standard.

Fusion Advanced's products, which include the AU5000 digital addressable fire system, offer both wired and wireless devices that are also ISO 9001 approved by SAI under the five-tick quality programme. All of the company's products are approved to the latest AS7240 standards that have already superseded AS4428 and AS1603.

**For more information, go to www.fusionfire.com.au**

# Turbo-powered Rescue

LUKAS has introduces a new mobile power unit for simultaneous operation of two hydraulic rescue tools. Called the P630 SG, it combines light weight and maximum power and features a turbo function to considerably speed up rescues. The new power unit is particularly suited for rescue work at traffic accidents, operations in rough terrain or hard-to-reach places, USAR and disaster response operations.

The turbo function doubles opening and closing speeds, which is particularly useful if tools with a high oil volume, such as telescopic rescue rams, need to be used. The design of the new oil tank, filling and usable quantity are almost the same; the standard oil filling is 2.2 litres. However, if required the tank can be topped up to the maximum oil quantity of three litres. The oil level can be checked visually through a slot in the side panel.

**For more information, go to www.lukas.com**

# Lightning Elimination

Lightning-strike avoidance systems that are protecting storage tanks in the petrochemicals sector and in the telecommunications and power generation industries around the world from the devastating and expensive consequences of a lightning strike are now available in Australia from DELTA FIRE.

Lightning strikes are a primary cause of fires in petroleum storage tanks and, unlike conventional lightning rods, the Lightning Eliminators & Consultants (LEC) systems are truly preventive. They combine lightning protection, grounding, and surge suppression to create what the Delta Fire calls an "isolation zone" that inhibits direct strikes to the protected site and minimises the effects of any strikes nearby.

3,000 of LEC's custom-engineered Dissipation Array Systems have been installed worldwide, amounting to more than 40,000 system years in service. Throughout this time, this direct lightning strike prevention system has maintained a success rate of over 99 percent.

**For more information, go to www.deltafire.com.au**

# ATEX-certified Luminaires

APPLETON has announced that its Areamaster LED series of flood/high bay luminaires is now available with ATEX certification (ATmosphères EXplosibles Directive 94/9/CE) for global use in potentially explosive locations requiring ATEX approval. The new ATEX version has the same light outputs and features as the current NEC/CEC models resulting in what Appleton claims to be the industry's highest lumens-per-watt output, superior colour rendering, and a service life of more than 60,000 hours.

The Areamaster LED ATEX version is available in two versions: a yoke-mount version and a chain-mount model. It covers voltage requirements from 220 to 240Vac 50/60Hz.

**For more information, go to www.appletonelec.com**

# Tough Cut

CUTTERS EDGE has developed what it believes to be a totally new cutting technology for rotary saws called the Bullet Blade. Unlike other carbide-tipped blades, it uses Cutters Edge Bullet Chain and is reckoned to be the only carbide blade that can be repaired and sharpened and used over and over again with the same blade core.

The new long-life Bullet Blade cuts a wide variety of materials – from roofs and timber to vehicles, thick metal and even concrete blockwork – with low vibration and minimal spark generation. It is available in 305mm, 356mm and 406mm sizes with an Arbor size to fit all brands of rotary saws.

**For more information, go to www.cuttersedge.com**

# Hazardous Environment Shelters

INTERTEC now offers an extensive range of fire-resistant shelters, including '1709' models designed to protect critical safety equipment from exposure to high temperature fires in hazardous areas. The shelters are entirely passive, maintenance-free and impervious to a wide range of corrosive chemicals – including salt, sulphur dioxide and sour or acid gas. Typical applications include protecting valves and actuators in the emergency shutdown and firefighting systems of refineries and chemical plants, and offshore oil and gas production platforms.

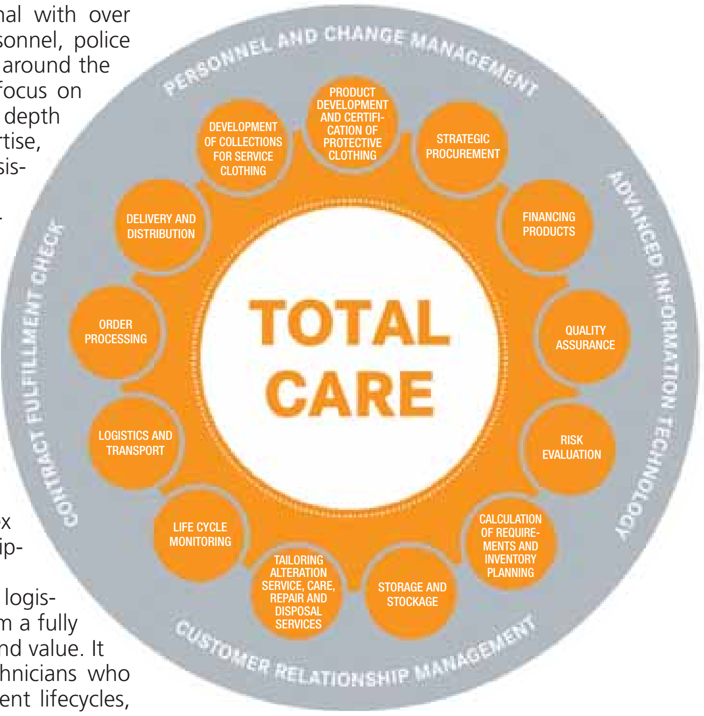
1709 fire shelters are designed to withstand hydrocarbon fires with a 'rapid-rise' time-temperature curve and are designed to keep valves, actuators and electronics operational by preventing their temperature exceeding 60°C throughout the protection period. The shelters' design has been verified by an independent agency, which confirmed that its protection period exceeded 90 minutes, and that during this time the surface temperature of a sample electrical actuator in the shelter did not rise above 55°C.

The composite material used for Intertec's 1709 fire shelters incorporates multiple layers of mineral wool and other fire resistant insulators, together with special fire retardant mineral coating.

**For more information, go to www.intertec.info**

# Outsourcing PPE Services & Solutions

LHD Group, formerly known as Lion International, is one of the world's leading providers of top-to-toe clothing and equipment solutions for a wide range of emergency services, the military and large corporations.


PERSONNEL AND CHANGE MANAGEMENT
ADVANCED INFORMATION TECHNOLOGY
CUSTOMER RELATIONSHIP MANAGEMENT
CONTRACT FULFILLMENT CHECK
TOTAL CARE
PRODUCT DEVELOPMENT AND CERTIFI-CATION OF PROTECTIVE CLOTHING
STRATEGIC PROCUREMENT
FINANCING PRODUCTS
QUALITY ASSURANCE
RISK EVALUATION
CALCULATION OF REQUIRE-MENTS AND INVENTORY PLANNING
STORAGE AND STOCKAGE
TAILORING ALTERATION SERVICE, CARE, REPAIR AND DISPOSAL SERVICES
LIFE CYCLE MONITORING
LOGISTICS AND TRANSPORT
ORDER PROCESSING
DELIVERY AND DISTRIBUTION
DEVELOPMENT OF COLLECTIONS FOR SERVICE CLOTHING

The company is truly multi-national with over 400,000 firefighters, military personnel, police officers and corporate employees around the world dependent on its service. The focus on quality, combined with an enviable depth of knowledge and specialist expertise, ensures the highest standards are consistently maintained, day in, day out.

LHD's organisational structure combines local knowledge and expertise with access to a global supply chain so that the company meets every aspect of its customers' clothing needs.

In-house designers, as well as fabric and garment technicians, work closely with customers to develop innovative solutions. Quality assurance technicians source raw materials and manage production and supply chain on a global basis, providing a one stop shop for customers with complex and extensive uniform, PPE and equipment requirements.

Unrivalled expertise in delivery and logistics ensures that customers benefit from a fully managed service that delivers quality and value. It is backed by locally-based service technicians who are specially trained to optimise garment lifecycles, adding further value.

In the fire service, LHD is recognised for the provision of high performance firefighter personal protection equipment to EN, NFPA and AS/NZ specifications, protecting more than 32,000 firefighters throughout Asia Pacific.

LHD provides a wide range of clothing and equipment to police and military organisations, which includes everything from uniform garments and protective footwear to ballistic body armour and helmets. In Germany, over 29,000 federal police officers and 240,000 military personnel benefit from clothing solutions that are designed, manufactured and managed by LHD. In the corporate sector, the company provides uniforms, work-wear and accessories across most industry sectors to a wide range of organisations, including Lufthansa, Credit Suisse and Serco.

A key factor in LHD's continued success is its unique 360 degree service delivery model with customer-centric processes that focus on the specific needs of the end user, from garment conception through to end of life management. This holistic approach starts with detailed consultation with the customer to gain a comprehensive understanding of every aspect of their needs with regard to operational use and management of all uniform items and protective clothing. The in-house design team then creates a bespoke solution that is fit for purpose. A product development phase allows for end user feedback and the sharing of best practice from the global team.

This process leads to a product that is comfortable to wear in its operational environment, and meets the required quality and performance standards. Logistics specialists will then create the most appropriate solutions for delivery as part of LHD's 'never-out-of-stock' policy.

The cleaning, repair and maintenance of garments is undertaken at LHD's in-house facilities by specialist technicians using the latest technology to ensures decontamination of all known viruses and blood borne pathogens at temperatures as low as 40°C. This increases tremendously the lifetime of garments. The team provide bespoke management information on an on-going basis, including a full asset history through LHD's own track and trace technology.

Through all the available modules of services, LHD provides a 'one-stop-shop' experience second to none in this field. With the help of streamlined and customised steps, LHD Group is able to offer cost saving, hassle-free, transparent solutions to the customer. APF

For more information, go to
www.lhd-gruppe.de

# New Portable Decon System

HUGHES has launched a new portable decontamination system for the fast and effective treatment of CBRN hazards. The compact back-pack comprises a Hughes ultrasonic atomizer spray and a specially-formulated chemistry stored in a pressurised delivery system. This latest addition to the Hughes offering is the result of collaboration with several partners specialising in biological and chemical treatments for CBRN and infection control.

Two formulations are available, one for CBRN, and a reduced strength for infection control. Together with the Hughes atomizer they offer a single versatile system for dealing with threats from the battlefield to the hospital ward – in fact, wherever there is a risk of contamination or infection.

A rechargeable compressed air cylinder within the back-pack provides the propellant to carry the chemical to the atomizer nozzle for delivery as a fine spray on to the surface being treated. The spread and size of the spray can be adjusted according to the application. Atomizing the spray ensures effective coverage without the risk of excessive wetting. In addition to spraying directly on to contaminated surfaces, the atomizer can be used to create a mist to capture airborne viruses.

The chemistry, MDF 200, has been developed by US specialist MODEC Inc. MDF 200 comprises a two-part chemistry which is premixed and stored within the back-pack, remaining active for up to eight hours. The system uses chemical and biological processes to encapsulate and safely supress contamination that may be deposited on surfaces or airborne. This process of containment reduces the risk of further dispersion, as in the case of radiation particles, and makes it easier to collect for safe disposal.

The MDF 500 formulation is half strength and intended for infection control applications. The chemistry has completed EEC testing and is suitable for treating a wide range of hazards such as the Norovirus, Anthrax and Avian Flu. It can also be used to treat mould or the potentially toxic residue from flood damage.

The chemical and delivery system employed in the new back-pack can also be used as part of the Hughes self-sanitising technology (SST) EndoStat.

**For more information, go to www.hughes-safety-showers.co.uk**

# CSIRO Conformity

FIRETRACE INTERNATIONAL has been awarded a Certificate of Conformity from CSIRO (Commonwealth Scientific and Industrial Research Organisation), Australia's national science agency, for its Firetrace pre-engineered, automatic fire detection and suppression system for electrical cabinets and enclosures. This certification – under CSIRO's ActivFire certification and listing scheme – covers the company's direct tube-based systems with 3M Novec 1230 Fire Suppression Fluid and carbon dioxide clean suppression agents.

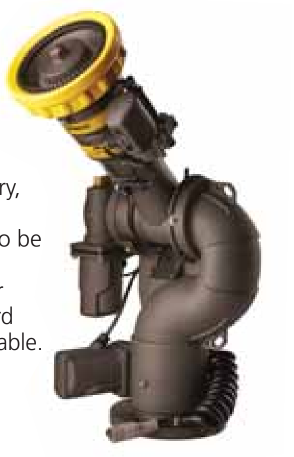
Currently there are more than 250,000 Firetrace systems installed around the world, many protecting essential electrical and machinery control cabinets and enclosures. These CSIRO certifications are, the company says, a major accreditation milestone that endorse the use of Firetrace for the protection of these business-critical assets, and are in addition to more than 25 other listings and approvals from world-renowned independent agencies.

The Firetrace certification is for ActivFire's product type 0501 (Gaseous fire extinguishing system equipment and components). These certificate documents are issued under the rules and procedures of ActivFire's conformity assessment scheme, and indicate that a designated product – in this case, Firetrace – has been evaluated and verified as conforming with specified requirements.

These specified requirements include Australian and ISO standards, UL and FM listing and follow up services.

**For more information, go to www.firetrace.com**

# Snake Has More Bite



ELKHART BRASS' Cobra EXM monitor is now available with 5680 litres-a-minute capability. Said to be smaller, lighter and more affordable than anything in its category, the COBRA EXM is also available as a 4730 litre-a-minute option with what is claimed to be less friction loss than competitive monitors.

The monitor is geometrically optimised for deck gun and aerial applications and standard and severe duty application options are available. It is easy-to-use, with two-way controls that allow wired or wireless operation.

**For more information, go to www.ElkhartBrass.com**

# Rescue to the Rescue

The HUSQVARNA K 970 Rescue is specially designed for rescue and clearing work. It boasts a unique power-to-weight ratio and is equipped with features like the new generation Active Air Filtration. This is claimed to be one of the market's most efficient centrifugal air cleaning systems that offers up to one year's operation without a filter change and SmartCarb – a built in automatic filter compensation and a highly efficient vibration dampening system.

It has a robust DuraStarter starter and an extra-large starter handle with space for bulky gloves. Control of the cutter is achieved by a chromium-plated blade guard that is visible in smoke and water spray, and the adjustable carry strap allows for maximum freedom of movement. The K 970 Rescue is equipped with an X-Torq engine, which reduces emissions by up to 75 percent and lowers fuel consumption by 20 percent. Air Purge and a decompression valve make it very easy to start.

**For more information, go to www.husqvarna.com**

# New Generation Search & Rescue

LEADER has introduced what it describes as a new generation of search and rescue equipment that the company says includes innovative products that are lightweight, ergonomic and efficient to give the greatest advantage in all phases of search: hasty, primary and secondary. The company is highlighting three products: Leader Search, Leader Cam and Leader Hasty.

Leader Search is a wireless life detector that is used in rescue operations to detect and then locate the position of victims entombed in collapsed structures. It will pinpoint and detect the slightest vibrations by effectively turning the entire structure into a giant microphone. It features three wireless sensors with a range in excess of 100 metres, and the additional option of up to three wired sensors. Leader Search comes complete with an ultra-lightweight and compact control box incorporating a high resolution full colour screen and user friendly menus and graphics.

Leader Cam search camera with communication is used during rescue operations to visually locate and communicate with victims. It is designed to identify with accuracy and precision the location of buried victims in difficult to enter confined spaces, communicate with them and evaluate and monitor their condition. Completely redesigned, its new compact and lightweight features provide the operator unrivalled ease of use. It features ultra-lightweight carbon fibre telescopic probe, extra-large high-resolution full colour screen and user friendly menu and graphics.

LEADER Hasty is a multi-functional tool that combines a search camera mode with a seismic detection mode. The search camera mode enables a visual and precise location of victims. Its ultra-lightweight probe is equipped with high intensity lights and flexible articulation of the camera head, which incorporates a microphone/speaker to allow communication between rescuer and victim. The seismic detection mode has up to two wireless sensors for detecting signs of life.

**For more information, go to www.leadernorthamerica.com**

# New Acoustic Gas Detector

DET-TRONICS has introduced its FlexSonic acoustic gas leak detector that is designed to withstand the harshest environments, from arctic to tropical conditions. Described as: "a revolutionary step forward over traditional gas leak detectors," it is claimed to be the first non-contact gas leak detector of its kind that recognises unique ultrasound "fingerprints".

The FlexSonic analyses 24 discrete ultrasonic bands, ignoring nuisance ultrasonic sources. A high-fidelity microphone continuously monitors for the distinct ultrasound emitted by pressurized gas leaks across the widest spectrum of frequencies. It can be programmed to ignore background noises, discerning between gas leaks and environmental noises, such as metal-on-metal contact, fans, machinery or vehicles. For noisy applications, the detector learns both regularly occurring and random sounds, detecting the actual acoustic gas leak 'signature.'

**For more information, go to www.det-tronics.com**

# Small-format Personal Camera

ISG INFRASYS has launched the all-new X380 that is being heralded as a powerful but small-format personal camera that delivers all the image clarity and features of a larger camera. It offers super-clear clarity with high-resolution imagery and a full-size LCD, all housed inside a lightweight and compact system. The camera can be custom-made to suit the exact requirements or budget of a fire department.

With features such as intelligent focus and direct temperature measurement (DTM) installed as standard, customers can opt for a simplified version with a single-button set-up for power on/off or up to a five button configuration providing exclusive functionality like the New Cold Spot Tracker, designed to allow first responders to locate and pin-point thread or valve gas leaks, or the Hot Spot Tracker, which allows the user to measure high temperatures in an entirely new and dynamic way.

**For more information, go to www.isgfire.com**

**PROFILE**

# Ensuring Firefight Safely

**Tom Hainsworth**

The deadly wildland fire in Arizona that killed 19 elite firefighters highlighted in the starkest possible way the risks fire crews take each time they don their personal protective equipment. Although the tragedy in Arizona was the most lethal firefighting incident in generations, blazes of this nature – although not as deadly – are becoming increasingly common. Tom Hainsworth, Managing Director of leading textile manufacturer Hainsworth, explains.

In the United States and Australia, this is attributed to a number of factors including volatile weather patterns, made up of stifling heat waves and prolonged droughts. US Forest Service Chief, Tom Tidwell, commented: "On average, wildfires burn twice as many acres each year compared to 40 years ago. The past two decades have seen fires that are extraordinary in their size, intensity and impacts."

The statistics are there to support this statement. Between 1980 and 1989, the average number of wildfires a year in the Western United States bigger than 1000 acres was 140; between 1990 and 1999, it was 160; while between 2000 and 2012, the average had leapt to 250.

In Australia earlier this year, record temperatures – believed to be the most extreme heat wave in the country's history – compounded the usual challenges faced by wildland firefighters. At one point during January in New South Wales, Australia's most populous state, firefighters were tackling almost 150 fires that ravaged more than 300,000 acres of forest and farmland, endangering

# ers Return Home

the lives of humans, livestock and wildlife. Just a few years earlier, in February 2009, devastating fires killed 179 people and destroyed more than 2,000 homes in the state of Victoria.

While the deadly fire in Yarnell in Arizona, and Australia's own wildland fires, rightly make the headlines around the world, countries not usually associated with extreme heat and wildland fires have also been more affected than usual this year. In the UK, fire crews have found themselves battling a huge increase in wildland fires this summer due to the tinderbox conditions. In London, alone, the number of such fires has increased five-fold on 2012.

Wildfires can start in many different ways. The Arizona blaze was the result of a lightning strike and spread rapidly in the extreme heat, fanned by strong winds. Many of the fires this summer in the UK were due to more prosaic reasons such as cigarettes and barbecues not being properly extinguished and broken glass bottles concentrating the sun's rays on the parched grass causing fires to ignite.

As a company involved in the manufacture of PPE for firefighters in many different parts of the world, it is crucial that we continually learn from specific incidents such as Arizona, as well as changing weather patterns and firefighting trends around the globe.

We were recently in Australia for AFAC 2013 and, while we were in the country, we arranged to spend time with wildland firefighters to understand first-hand the environment in which they operate, what it feels like to wear our kit, and how we can continue to innovate to help their crews meet the challenges they face. A few years ago, I did something similar while on a visit to the United States, spending time with fire crews in San Francisco. It was fascinating to observe how they planned their response to a wildland fire, constantly monitoring the weather and changes in wind direction and their potential escape route.

The development of PPE works best when we are learning from fire crews about the considerations that need to go into the manufacture of fabrics and garments, and when the firefighters learn from manufacturers like Hainsworth about how the end user can get the most from their PPE. Innovation needs to be backed up by a strong understanding of the science behind the performance of the products that have been developed and a thorough appreciation of the risks being faced by the end user. Only by understanding these two areas well, can you properly assess the performance of the innovation in real life.

The design of our fabrics is heavily influenced by the environment in which the firefighter will operate. For example, as we saw with Arizona, firefighters tackling wildland fires can often be at the scene for many days exposed to the most extreme conditions. The wildland firefighter has only one layer, which is both the outer-shell and next to the skin and therefore has to prevent heat from getting in while also moving moisture away. All kit has to be robust enough to offer high levels of thermal and mechanical protection while also being light and breathable enough to minimise heat stress.

One of the biggest challenges facing those involved in the garment manufacturing process is to marry the best possible protection with the best possible levels of comfort. The garment manufacturer needs to understand fit, comfort and the relationship between that and protection, while a fabric innovator, such as Hainsworth, needs to have an appreciation of all of these requirements as well as an in-depth understanding of how different fibres react in different environments.

> **The development of PPE works best when we are learning from fire crews about the considerations that need to go into the manufacture of fabrics and garments, and when the firefighters learn from manufacturers about how the end user can get the most from their PPE.**

During recent months, we have looked closely at how our company, its technologies and products and the PPE industry itself have evolved over the past 40 years. As a result, we have created Hainsworth Technology under which sit three principal strands – Titan, Eco-Dry and Advantage. In simple terms, Titan is concerned with outer-shell systems, Eco-Dry is about the linings that sit next to the skin driving comfort and sweat management, while Advantage covers our many finishing technologies and product enhancements.

Our customers and partners and visitors to AFAC heard more about Hainsworth Technology – Protects You – and our plans to ensure that all of the work carried out at our historic textile mill in Yorkshire, England, and with our partners around the world, continues to enhance the protection of our fire crews.

Incidents such as Arizona help to concentrate the mind of manufacturers such as Hainsworth. When I see the headlines, it simply strengthens the resolve of my company to ensure that we meet our number one objective: To protect individuals that work in hazardous environments from burn injury so they return home safely to their families. APF

For more information, go to
www.hainsworth.co.uk

# Conference Expos Things to Come

**Graham Collins**

This year's AFAC/Bushfire CRC Conference in Melbourne, Australia was certainly not a "talking shop" where old topics were dusted off and given their annual airing. In addition to AFAC 13 breaking all records with delegate numbers topping the 1700 mark – up from 1100 in Perth in 2012 – and with the greatest ever number of exhibitors showing off the latest and best firefighting and rescue equipment, it set out just how the emergency services management landscape is likely to look in the coming decades.

Such was the success of this year's AFAC (Australasian Fire and Emergency Services Authorities Council) conference that it positioned itself firmly as the Asia Pacific region's premier knowledge sharing event for the emergency services and land management community. World-renowned presenters for across Australia and New Zealand, the UK and USA addressed a whole raft of topics that are increasingly uppermost in the minds of the planners and implementers of strategies tasked with meeting today's challenges and, significantly, those likely to be experienced in the coming years and decades.

The annual three-day event, this year at the Melbourne Exhibition and Conference Centre, had as its theme: *Shaping Tomorrow Together*, emphasising the imperative need for the emergency services to work together collaboratively with the community and all the other interested parties. A choice of theme that could not have been more appropriate, as speaker after speaker argued that the increasing incidence, severity and impact of natural disasters across the region and across the world – floods, storms, cyclones, bushfires, tsunamis, earthquakes and droughts – is challenging everyone concerned to rethink how to meet these potentially "out of scale" challenges.

The scene was set by the conference's two keynote speakers. David Kaufman, Associate Administrator for Policy, Programme Analysis and International Affairs at FEMA (Federal Emergency Management Agency) in the USA gave a presentation entitled: *Towards More Resilient Futures – Putting Foresight into Practice in 2013 and Beyond*. Professor Tim Flannery, Chief Climate Commissioner at the Climate Commission followed this with a keynote paper entitled: *The Critical Decade – Preparing for More Extreme Weather*.

The picture painted by many of the experts in other keynote addresses, nearly 30 research presentations and just short of 50 main conference presentations went on to make it crystal clear that there is no room for complacency, and possibly little time for prevarication. Several of the presenters described a future climate and climate-driven natural disasters that will forever change out of all recognition the emergency management and response paradigm. This will place unprecedented demands on decision makers, strategists and

# es the Shape of

agencies and greatly heighten the need for shared-agenda cooperation.

## CRC, But Not As You Know It

The conference started with a one-day, four-stream Bushfire CRC (Cooperative Research Centre) Research Forum that, with a forthcoming change in the role and focus of the CRC will be the last of its kind, certainly in this format. Some of the current and recently completed research projects formed the basis of a number of the Research Forum's presentation, while others were described in poster presentations.

While the Australian government's decision to make a major change to the role and function of Bushfire CRC was announced earlier this year, the conference was the first opportunity to set out the organisation's changed and much expanded role.

After ten highly productive years focusing on bushfire research and establishing the organisation as arguably the world's premier bushfire research knowledge base, from next year the organisation will be transformed into the Bushfire and Natural Hazards CRC, with the emphasis firmly on the word "Hazards". As the name implies, the organisation's research will from 2014 embrace research on all natural disasters with the aim of creating a more disaster resilient Australia and New Zealand.

Bushfire CRC's legacy is that it added national research to the country's fire service industry and undoubtedly helped to create a culture of national research and utilisation, which has accelerated over recent years leading to much of its work having an impact on public policy and practice. Expanding its brief to encompass other natural disasters is therefore surely a move to be welcomed.

More information on the new CRC is available at www.bnhcrc.com.au.

## Prevent, Prepare, Respond, Recover

Delegates to the conference come from state, federal and local government departments, the emergency services, industry, non-government organisations and research and education organisations from across the world.

The first day of the AFAC 13 conference was split into four streams and covered such sub-group topics as strategic issues, large scale disasters, the regulatory environment, community and business resilience, and new developments in urban firefighting. Another topic that attracted considerable attention was situational awareness, with a presentation given by Dr Richard Gasaway from Situational Awareness Matters in the USA; a subject that was expanded upon later in the conference by Lisa Frye from Australia's Department of Sustainability and Environment.

The second day of the conference followed a similar pattern. This time the sub-group topics spanned from major incidents, changing organisational paradigms, managing landscape and resilience to leadership.

Significantly for attending delegates, there was ample opportunity for informal one-to-one discussion with the presenters in the Knowledge Lounge in the main exhibition hall.

## AFAC 2014

Plans are already well advanced for the AFAC 2014 conference, which will be held in Wellington, New Zealand from the 2nd to the 5th September, when the theme will be: *After Disaster Strikes – Learning from Adversity.*

This event will again bring together the world's leading experts, this time to examine how emergency management services, land managers and communities prepare, responded and assisted with recovery to develop evidence-based policies and practices for the future. Its aim will be to bring together and share the combined wisdom of experience, research and analysis from across the sector to enable a deeper understanding of the approaches needed to secure the region's future and prosperity. More information on AFAC 14 – the 21st AFAC conference – is available at www.afac.com.au. APF

# Flexibility + Plann

*Trees, homes, risk – the new subdivision of Molongo in Canberra. Pic courtesy of Jessica Weir*

**Professor Barbara Norman**

Bushfire Cooperative Research Centre

Clear guidelines for planning in new housing areas are needed to respond to the issues facing emergency management now and in the future.

Fires, floods and coastal storms continue to dominate the landscape across Australia, placing significant stress on communities and emergency services. For bushfire risk, the recognition of the importance of land planning was noted as early as the 1939 Stretton report into the Black Friday bushfires in Victoria. The report identified: "…a lack of policy integration between the range of departments concerned with land utilisation control…". So, in 2013, a key question is whether the Australian land planning system is helping or hindering the process of minimising risk to affected communities?

There are eight planning systems in Australia, one for each state and territory. There are significant commonalities, but differences lie in policy and implementation. This is due partly to geography, but also the political landscape. In that sense, place, planning and politics are never far apart.

As part of the broader Bushfire CRC research project entitled Mainstreaming Fire and Emergency Management Across Legal and Policy Sectors, the University of Canberra, in conjunction with the Australian National University and RMIT University, has been examining planning and bushfire. Workshops in the Australian Capital Territory, New South Wales, Victoria and the Northern Territory during 2012 highlighted different local experiences with fire, risk and planning responses.

Planning for risk and uncertainty across the landscapes (cities, coasts and inland) involves considering a range of potential impacts. Recent experience indicates that we need to better plan and prepare for the impact of extreme events. In this respect, improvements can be made with connections and communications between urban and regional planning and emergency management.

Key issues include assessing risks, including cumulative risk and a coincidence of events, coordinated planning across government to minimise disaster and an understanding by decision-makers of the range of policy responses available at a level that facilitates coordinated action. Scenario planning can assist here, resulting in a deeper understanding of the impacts. The 2011 Brisbane floods, which coincided with a king tide that had disastrous consequences, is a good example of this.

All of these issues need to be considered in the context of climate change. A recent editorial in *Nature* highlights that following Hurricane Sandy in late 2012, the US Federal Emergency Management Agency (FEMA) is now incorporating "…long-term climate projections, including for sea-level rise, into its rate structure for the federal flood insurance programme…". It goes on to conclude that: "…how fast New York bounces back will depend not only on damage to infrastructure

# ing = Uncertainty

*Business as usual is not sufficient to minimise risk to communities, such as the near miss from a bushfire to these houses in Gnarabup, Western Australia. Pic courtesy of Bushfire CRC*

but also on the strength of social networks and the general health of the communities affected." In other words, FEMA has placed the risks of climate change squarely on the agenda and is actively building onto its decision-making processes.

In further recognition of climate change, the US Government Accountability Office (GAO) has placed climate change for the first time in the list of 'high risks' facing the US – in this context, financial risks: "Climate change poses significant financial risks to the federal government, which owns extensive infrastructure, such as defence installations; insures property through the National Flood Insurance Program; and provides emergency aid in response to natural disasters. GAO added this area because the federal government is not well positioned to address the fiscal exposure presented by climate change and needs a government-wide strategic approach with strong leadership to manage related risks."

The larger challenge then is planning for risk and uncertainty in the context of climate change. There is already shared learning emerging from the range of recent disasters involving fire, flood, coastal storms and heat. Adapting to a changing environment adds a new dimension to risk of a scale not planned for previously. In this respect 'business as usual' in planning decisions will not be sufficient and will require at the very least a review of planning controls throughout Australia on the location of development in high-risk areas.

An insight into why we keep building in high-risk areas (fire, flood, eroding coastal edge) is provided in the NSW Independent Commission Against Corruption (ICAC) report of 2012. This report concludes that: "In recent years, there has been an increasing tendency towards departures from the stated requirements. The existence of a wide discretion to approve projects, which are contrary to local plans and do not necessarily conform to state strategic plans, creates a corruption risk and community perception of lack of appropriate boundaries. A re-emphasis on the importance of strategic planning, clear criteria to guide decisions and a consistent decision-making framework will help address this issue."

There is considerable research on a number of these issues with the Bushfire CRC, the National Climate Change Adaptation Research Facility and the CSIRO Adaptation Flagship. The research provides a good basis of evidence concerning risk. However the next step needs to address the process of better implementing clear guidelines for planning and land-use development decisions that incorporate the considerations of emergency management.

Continuing to build on floodplains, on the edge of eroding coastlines and in high-risk fire areas is not responsible or sustainable from any perspective. This will require some tough decisions with significant policy implications. In essence:

- Adapting to climate change requires a more integrated and coordinated response across government.
- "Business as usual" is not sufficient to minimise risk to communities in the future.
- There are areas where building, rebuilding and locating infrastructure will not be possible due to the high risk of disaster.
- Clear criteria are required for better integrating risk management into land-use and development decisions at all levels of government and need to be implemented throughout Australia.
- A changing environment will require a continuing risk assessment involving the latest science, the financial sector including banks, and community leaders.
- An on-going program of capacity building is necessary through education and training, particularly for planners, to better understand the risks and needs of emergency management.

In recent months there has been increasing public discussion about flexibility in the planning process and cutting the "green tape". While efficiency in delivery is important, so is effectiveness. In support of ICAC's conclusion, I argue that flexibility in process and flexibility in policy is code for no planning at all. This scenario does not provide sufficient certainty for communities at risk or industry for long-term investment decisions. Clear guidelines for planning need to be developed that better respond to the issues facing emergency management now and in the future. **APF**

**Professor Barbara Norman** is Bushfire CRC Urban and Regional Planning Systems project leader and Foundation Chair, Urban and Regional Planning at the University of Canberra

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**Graham Collins**

# Powerful Gear

## What's New in Extrication & Rescue Tools?

New and improved hydraulic extrication and rescue tools are continuing to change the speed, efficiency and safety in which rescue operations are being carried out. Here we take a look at some of the latest unveilings from the world's top manufacturers.

# Three-Stage Power

RESQTEC has announced the launch of its new 3SR three-stage radial power unit with the promise of some really interesting features and a feature-packed specification.

The 3-stage pump technology is a major improvement over widely used 2-stage technology and offers faster cutting performance with less reaction forces, which is in line with the company's Ultimate Pressure technology. It maximises output performance with smaller and lighter engines.

The new unit boasts service management, HF management and TP Shield technology; optimum performance at low operation costs. The standard embedded hour-tachometer allows for accurate maintenance intervals based on the running hours (mileage) keeping the 3SR in optimal condition. The 3SR can also be upgraded with a total care service pack allowing full control of maintenance costs.

With HF management, the 3SR offers extremely high reliability as it keeps the hydraulic fluid at an optimum quality and steady temperature level resulting in optimum performance and a high energy efficient system in all situations. It also comes with an extreme low centre of gravity and its wide feet allow a steep angle tipping point. This technology allows for deployment on steep slopes, mountain sides, collapsed building environments or on simply flat roads.

**For more information, go to www.resqtec.com**

# Rescue Spider

The HOLMATRO Spider range is being promoted as the latest innovation in hydraulic pump performance. By enabling faster tool operation in the most commonly used working pressure range, revolutionary three-stage pump technology makes the rescue operations much faster.

Four models are available with a variety of features and options to meet rescue workers' personal requirements. The SR 10 super-compact petrol pump is the smallest in the range and offers single tool operation, while the SR 20 compact pump is available with a petrol or electric engine for single or multiple tool operation. Both the SR 10 and the SR 20 are lightweight and ergonomically designed for ease of carrying. The SR 30 compact rescue module comes complete with hose reels and tool support, and the heavy-duty SR 40 is said to be lighter than comparable pumps on the market.

All models in the Spider range incorporate three-stage pump technology. This delivers higher flow in the second stage enabling rescuers to cut through the B-pillar of an older model car in half the time it takes a two-stage pump. The third stage delivers lower flow yet higher pressure, allowing the rescuer to cut through hard, reinforced pillars in a controlled way. The result is faster tool operation and more control when you need it.

Other standard features include Core single hose technology and a large hydraulic oil capacity for use with any tool, including all heavy-duty rescue equipment. SR 20, 30 and 40 models even offer simultaneous tool operation. Optional extras include LED lighting and a quick-fix-and-release bracket with universal mounting to secure the pump in the truck.

**For more information, go to www.holmatro.com**

# ProFix Versatility

According to RESQTEC, the first step in vehicle extrication is stabilisation; you always have to prevent potential movement caused by the techniques and equipment used by rescuers. Key in vehicle stabilisation is to ensure the vehicle has as much contact as possible with the ground. You need to create contact points spread over a wide area so that optimum stability is created. Selecting those points is not easy as you do not want to block the access to your victim, but do need a stabilised vehicle.

However, stabilization involves more. You have to consider the centre of gravity and the point at which all the weight of the vehicle is concentrated. The closer the vehicle's centre of gravity is to the ground the more stable it gets. An estimation of the vehicle's weight will tell you what force is required to move it.

While cribbing offers good stability when the vehicle is stuck on all four wheels, when the vehicle is on its side, on its roof or even crashed into a building, cribbing alone is no longer sufficient. Vehicle stabilisation kits are essential in such cases.

RESQTEC's ProFix Max is designed to be used in multiple stabilisation applications. It can be operated pneumatically, mechanically and hydraulically with a maximum working pressure of 10bar and a capacity of 14 tons.

It is outfitted with a telescopic system, the benefit of which is that it automatically locks when an object starts moving or shifting, offering great safety to both the victim and the rescuer. Even when taking close care of the situation the rescuer should never underestimate the fact that objects still have the intention to shift unexpectedly. With the ProFix Max RESQTEC offers a stabilisation system that secures the load inch by inch. Manually tensioning is also possible with the adjustment collar. The ability to operate the ProFix Max with a remote control is another feature.

The automatic locking system enables the ProFix Max to be used for multiple applications, whether facing a situation in which a vehicle needs stabilisation, structural collapse needs securing, a wall requires support, trench, even stabilising a train, bus, truck or a tank. Its various accessories provide the right adapter for easy placement whatever the surface. Its extensions allow the length to be extended by another 150mm to 1.20 metres.

The ProFix Max's uniqueness lies in that it is fully integrated with the other tools offered by RESQTEC. Using the connector tool allows it to be connected to a ram. The PowerPlate provides a strong base for any ground surface, where the MultiSwivel allows the ProFix Max to be turned in any position. The ProFix Max part of RESQTEC's Octopus system.

**For more information, go to www.resqtec.com**

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# New Mini has Boost

AMKUS Rescue Systems has introduced its latest innovation in high performance extrication tools and equipment, the GH2B-MCH Mini Power Unit.

The GH2B-MCH offers two-tool simultaneous operation with "boost" mode. When in alternate operation, "boost" mode will increase tool speed in both pump stages. Weighing in at approximately 28 kilogrammes, the compact unit offers a carrying handle and is extremely portable. In addition, the modular design reduces the time required for servicing.

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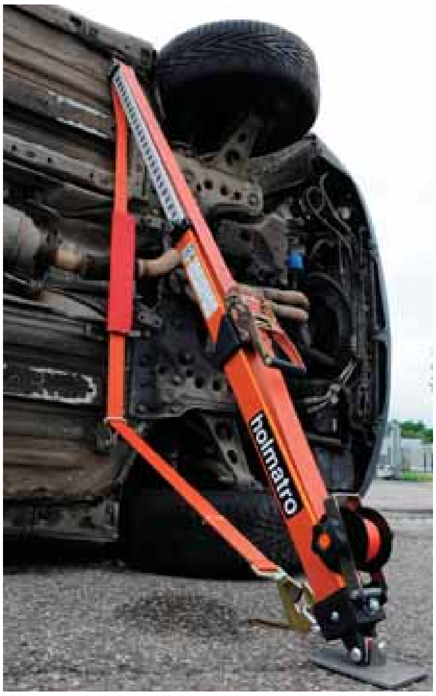
# V-Strut Stability

The key to success is maintaining safety and reducing time on scene by using intelligent hydraulic and assist tools, specifically designed with the rescuer in mind. The importance of safe and rapid stability can never be over emphasised. The new V-Strut from HOLMATRO provides stability in a wide range of scenarios to many types of vehicles in 15 seconds. This allows the medics to gain entry and stabilise the patient, thus allowing the technical rescue to begin sooner, and as we know, saving time saves lives.

The thinking behind the V-Strut from Holmatro is that stability is literally the foundation of any successful casualty-centred rescue. Preventing vehicle movement is vital as it prevents any further injury to the occupants, provides a solid base for medical intervention, and prevents any further structural deformation of the vehicle during the rescue process

Once safety on scene is established, stability can begin. Entry into a vehicle should only be made once stability is completed (unless a casualty is at immediate risk, due to a compromised airway) and the process should be safe, rapid and easy, allowing casualty care to begin immediately. If the process of stability is delayed, safety is compromised, as is casualty care, and the technical rescue cannot progress. All of this adds to your on scene time and delays extrication.



Worldwide, statistics differ, but the majority of extrications are performed on vehicles that are still on their wheels where blocks and wedges are adequate. However, a proportion of vehicles will be on their roof or on their side following a collision and the mechanism of injury means that effective stabilisation is critical and additional equipment will be required. Often the final position of the vehicle may be off road, on uneven surfaces and on soft ground, so the equipment you choose must be able to cope with this type of environment.

The new Holmatro V-Strut makes stability of vehicles in such positions, safe, rapid and easy, meaning that casualty access can be gained as soon as possible. Its intelligent design means that the strut can be extended in a single action to precisely the required length (due to small intervals) and auto locks, saving time. Its serrated multi-purpose head means that it 'bites' into the vehicle construction, with no need to find an edge to hold against. Its tilting foot means that the strut can be inserted at any angle, allowing use off road. Its design and construction means it is ergonomic, perfectly balanced and extremely light weight, all of which reduces the burden to the rescuer during use.

Its fully extended length of 1.8 metres and shoring capacity of 16kN means that it is suitable for use in a wide range of situations and on a wide variety of vehicles, including the ability to reduce movement to truck cabs that require stabilisation independently from the chassis.

**For more information, go to www.holmatro.com**

# Rescue Tool Mobility

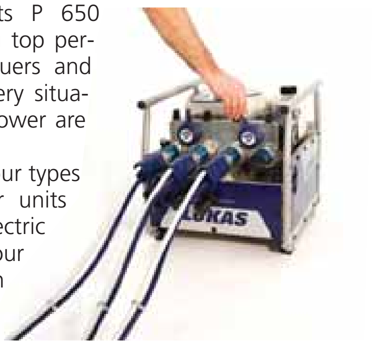
The P 600 OE from LUKAS makes hose-connected rescue tools mobile. It gives the maximum freedom of movement in every situation because it is small, light and easy to handle. It also enables location-independent use of a rescue tool in the optional battery mode.

Rescuers have the choice: operate the rescue tool with mains power or with a high-performance battery. The power unit has a unique energy management system that guarantees extremely long running times.

The P 600 OE is: patient-friendly, with no exhaust fumes and very quiet operation; it is small, weighs less than ten kilograms and is easy to use; offers almost unlimited radius of action; is ideal for traffic pile- ups or off-road; has an illuminated oil tank; and is suitable for one-man operation. It offers a low pressure – high pressure flow rate of 2.6 litres-a-minute to 0.5 litres-a-minute and measures just 480mm by 182mm by 257m.

**For more information, go to rescue.lukas.com**

# Maxi-Powered Rescue



LUKAS is promoting its P 650 4Power units as offering top performance for both rescuers and rescue equipment at every situation where speed and power are called for.

The company offers four types of P650 4Power power units with gasoline and electric motors Thanks to their four connectors, they can supply up to four tools with full power at the same time. When conditions require fast work at maximum power, the switch to turbo mode is quick and easy, causing the power unit to combine two oil flows and direct them to a rescue tool with high oil volume. When a complete rescue set with cutter, spreader and rescue ram needs to be operated, the 4Power unit supplies two tools in normal mode and a third – such as the rescue ram, with high oil requirement in turbo mode.

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# Foam Free ARFF Testing gets the Green Light

**Kaare Holm**

NoFoam Systems

With the recent publishing of the revised NFPA 412 Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment, fire chiefs across the Asia Pacific region are re-evaluating their ARFF testing procedures.

Even though many countries leave it to the local airport fire chief to determine how to test, most chiefs look to NFPA 412 and other guidance documents for expertise and approaches that will help them maintain the preparedness and firefighting capabilities with which they are tasked. After all, a million dollar ARFF vehicle and its four-man crew may stand ready around the clock for years, waiting for those critical few minutes with a chance to save lives, but if the foam system does not function at that moment, it is all for nothing.

The NFPA 412 committee recently gave its full support to an ARFF vehicle testing approach that will eliminate most of the environmental issues associated with testing the foam system, by allowing the major part of the test to be performed with water alone, thereby preventing most of the foam from entering the environment. With an overwhelming 27 to 1 vote, the committee approved this novel testing approach as an alternative to the refractometer and conductivity meter test, making this approach the largest change in the revised NFPA 412 document.

This change in the NFPA 412 standard is a reflection of the mounting external pressure towards increased environmental priority, which is felt by both airport operations and fire station management in many larger airports. One of the key environmental concerns relates to the use of various firefighting foams and their responsible disposal – or lack of same. Although this issue is not new, the increased public awareness has certainly re-fuelled the debate and the interest in finding better solutions.

As a firefighter in action, the priority is to save lives and structures, while staying safe despite the inherent dangers of the job. In those situations, concerns about the environment are, at best, a distraction. On the other hand, on a day-to-day basis, the priority is to prepare for emergencies, and this includes training as well as performing equipment testing and maintenance; in those tasks environmental responsibility does become a priority. The question often becomes: "How can we maintain preparedness while achieving better environmental stewardship"?

To better explain the fundamental novelty of the approved testing approach, the standard is now referring to the "old" testing methods as 'output based testing', meaning that you 'output' foam, then collect and analyse the percentage mix, using a refractometer or a conductivity meter. In contrast, the standard is referring to the "new" testing method as 'input based testing', meaning that you simply measure how much foam concentrate and tank water you 'input' into the proportioner. The assumption here is that what you put in is what you get out. So, for example, if the flow rate of the foam concentrate is 3.2 percent of the total output (water flow plus concentrate flow), then the foam that comes out of the nozzle is going to be 3.2% percent. Now you do not need to collect and analyse actual deployed foam samples to determine the percentage you are getting.

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Now, because you do not have to analyse the foam, you also do not have to use actual foam concentrate to perform the test, since you simply measure the litres per minute – and here is where it gets interesting. If you close off the foam tank and instead run plain water through the foam concentrate supply pipes, you can test the entire foam system, without producing foam that ends up on the ground, just by mixing water with water. And that changes everything. Do the mental maths; how much of your foam production is for testing and training, and how much of it is for actual aircraft emergencies?

Sounds good, but does it actually work, you may ask?

Well, the NoFoam technology has already been deployed in the field for several years. Over 200 ARFF vehicles across more than 50 airports use the system worldwide. In the Asia Pacific region, the system is now used in Japan (Iwakuni and Okinawa), in Korea (six airports), in Australia (nine airports and a training facility), as well as in Hawaii. The majority of these systems were made available through NoFoam Systems.

Civil airports have been reluctant to adopt the system in the past, simply because the approach

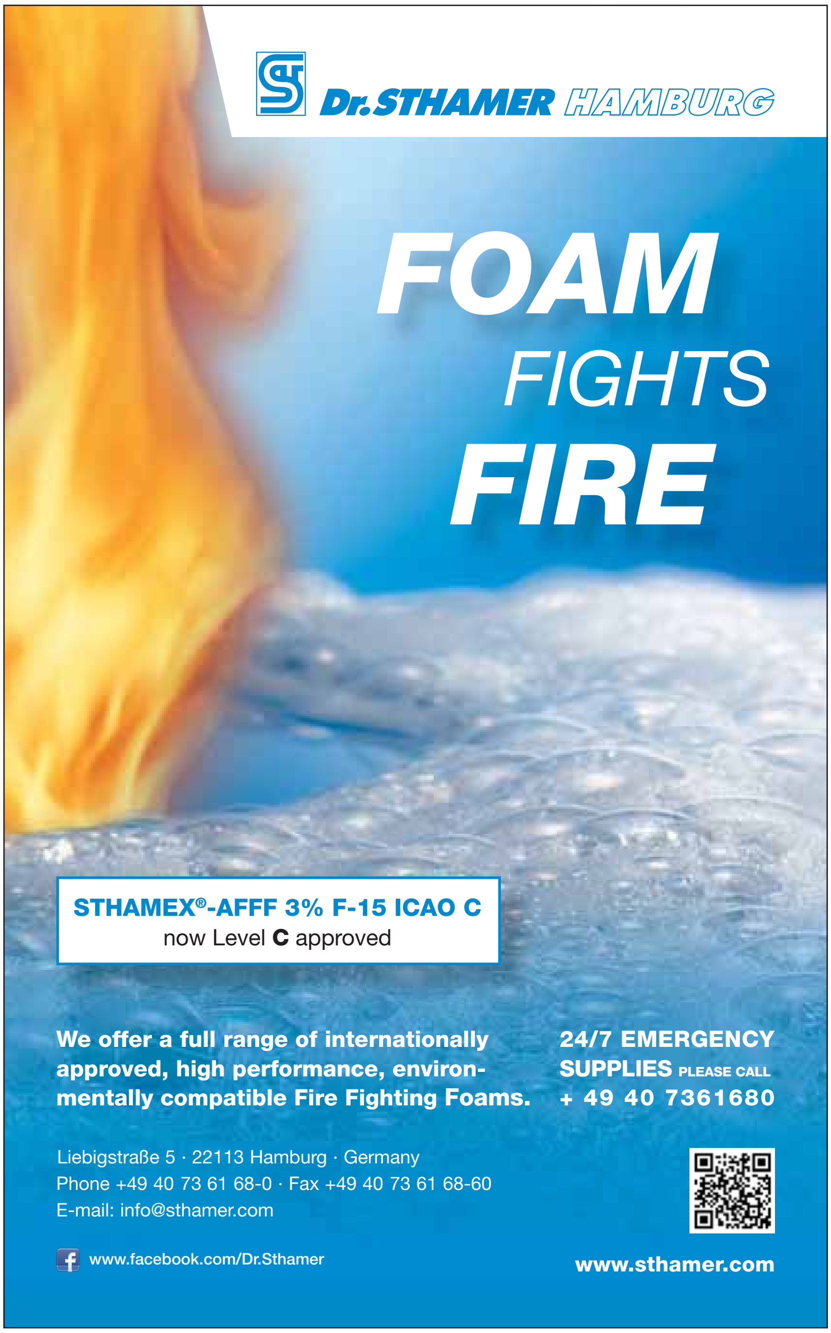
was either not well known to them, or not approved by the NFPA 412, but the tides are turning as a result of the pull from environmental regulations and stricter environmental oversight. For example, Japan has long been concerned about the environmental effects of firefighting foam, particularly in the locations that are close to fragile ecosystems and freshwater supply. As a result, the government of Japan is preparing to use regulations that will address Perfluorooctane Sulfonate (PFOS) in firefighting foams, in an effort to reduce or eliminate this potential source of contamination. In Australia, the environmental regulations already require that used foam solution is collected and hauled away for destruction by private contractors, at a yearly cost of up to $100,000 for each airport.

**You can test the entire foam system, without producing foam that ends up on the ground, just by mixing water with water. And that changes everything.**

Because of these cost and regulatory challenges, many fire chiefs are constrained to limit their testing schedule to once a year, coinciding with the annual inspection for the airport certification.

Needless to say that a vital system that is exposed to corrosive and clogging chemicals should be tested for proper functioning more often than once a year. In fact, some of the leading entities, when it comes to keeping mission critical heavy equipment ready and operational, require that their ARFF vehicles are tested at least monthly or quarterly, whereas some go as far as testing every two weeks. This is true across hundreds of US Navy and Air Force bases, as well as throughout all Australian Defence airports.

The changes to the recently published NFPA 412 Standard address the demand for preparedness and environmental responsibility. Using the input-based testing approach enables fire chiefs to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cost-effectively test the ARFF vehicles much more frequently, with no clean-up costs, no environmental concerns, and no recurring cost for testing. The initial cost of acquiring the vehicle modification kits and the testing equipment is off-set by savings in both avoided clean-up costs and avoided costs of replenishing foam concentrate supplies. With so many of the Asia Pacific airports located next to fragile ecosystems or waterways, the revision to the NFPA 412 is good news for both the fire chiefs and for their environmental oversight agencies.

How does it work? Using the system requires only a minor one-time modification to the ARFF vehicle – each vehicle is designed differently, so the modification kit is specific to the vehicle, but in general terms it involves a two-to-three hour installation of a manual foam tank shut-off valve and an external access point to the foam concentrate pipe. During testing, the foam tank is closed, and the flow rate is measured from an external NoFoam trailer connected to the access point. The trailer uses a benign dye in its water tank, which supplies the water that is used instead of foam concentrate. That way, the operator can see when the 'foam substitute' is shooting out.

**It is up to the airport management to re-examine how they should look at ARFF testing in the future. This usually starts with the fire chief or the Authority Having Jurisdiction (AHJ), who determines how they test and how often they test; and it ends with the airport inspector, who determines if the ARFF vehicles are properly maintained.**

During testing the system shows the real-time foam substitute flow rate, which enables the operator to see when the flows have stabilised. This overcomes one of the sources of error from refractometer-based testing, which is to collect the sample too early after starting to flow foam. The other significant improvement to the precision of the test result is to go from using a small random sample, as necessary for a refractometer-based test, to using the full flow as the basis for evaluating the exact percentage of the foam solution being produced.

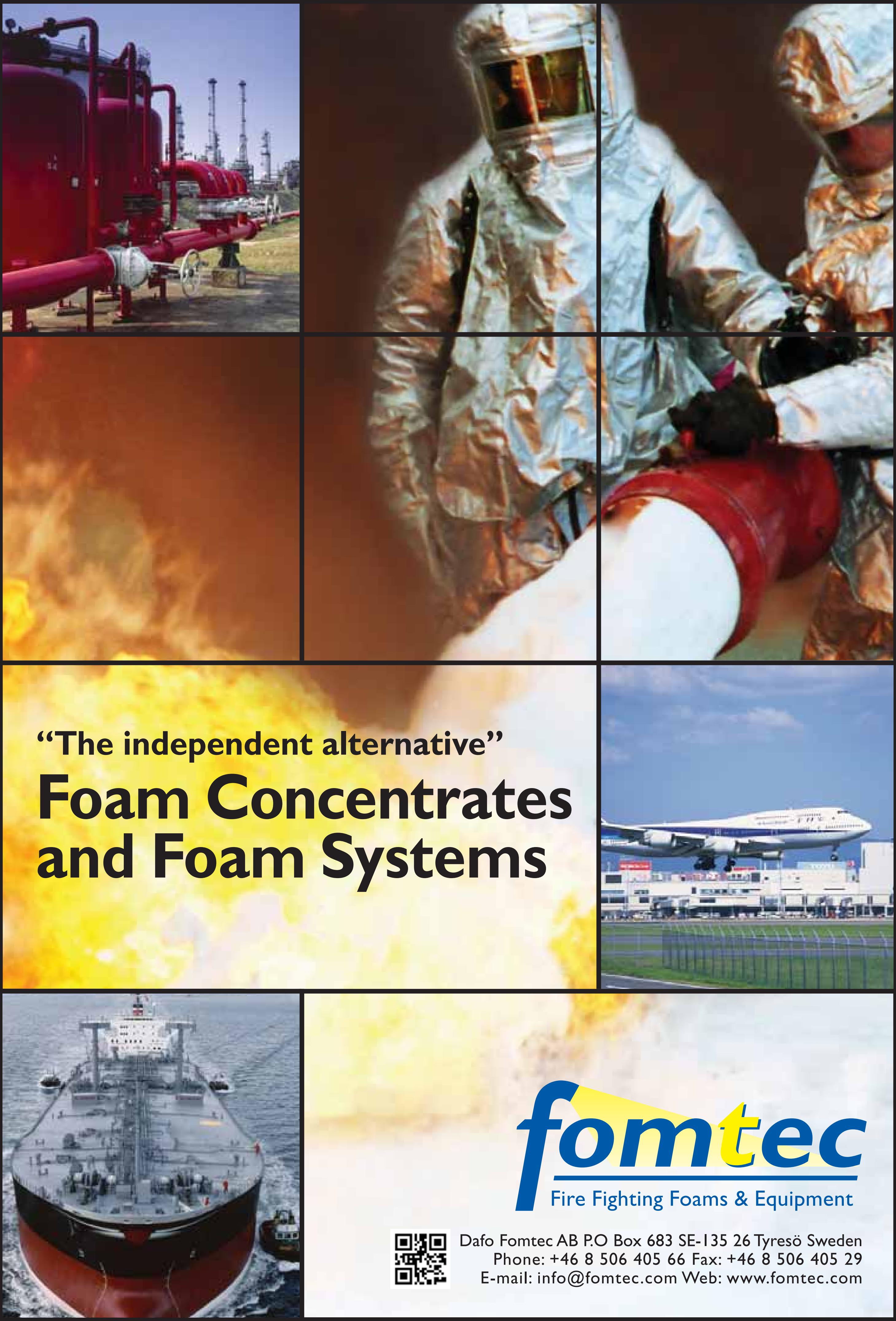
With NFPA 412 leading the way for better safety through more affordable frequent testing, cost savings and an improved environment, it is up to the airport management to re-examine how they should look at ARFF testing in the future. This usually starts with the fire chief or the Authority Having Jurisdiction (AHJ), who determines how they test and how often they test; and it ends with the airport inspector, who determines if the ARFF vehicles are properly maintained. In parallel, it is up to the national environmental agencies to be vocal and encourage the adoption of the new approach, since it reduces or eliminates an environmental impact at its source.

In fact, the international ICAO Aerodrome Standards recommends that: "A system of preventive maintenance of rescue and firefighting vehicles should be employed to ensure effectiveness of the equipment…". So perhaps it is even time for each nation's Airport Authority (and their individual inspectors) to re-evaluate if this recommendation gives them justification to request that foam systems are tested more than once a year, now that it can be done without financial or environmental implications.

The full text of the revised standard can be viewed for free at www.nfpa.org/ (type '41214' in the search box). **APF**

**Kaare Holm** is the founder of NoFoam Systems and was the proposer and original author of the new changes to the NFPA 412 standard

For further information, go to www.NoFoamSystem.com



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# Intumescent Coatings: Key Considerations for Specifiers

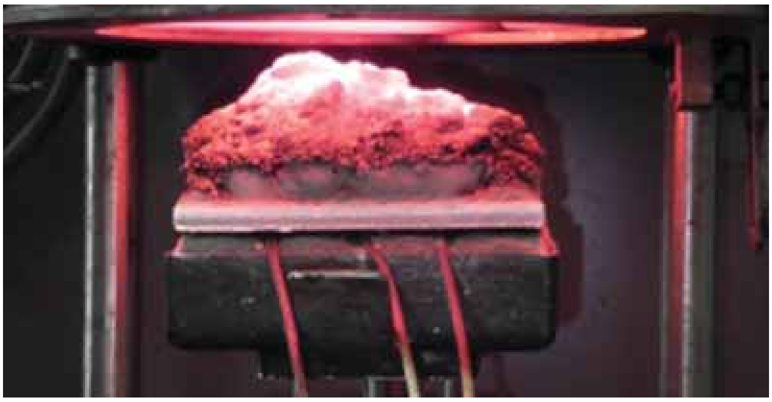
Fire protection is an important life safety issue and warrants careful attention to detail at the planning and design stage of a project. Ensuring that a specification for passive fire protection to structural steel has been written correctly is critical. So what are the key issues to be considered for specifications in the Asia Pacific region?

The Asia Pacific region constitutes a significant part of the global opportunity for fire protection of structural steel using intumescent coatings. The demand for structural steel is growing steadily in many developing countries in the region, particularly in non-residential buildings. The demand for intumescent coatings in this region is also driven by large investments in the oil and gas sector, particularly with the recent discovery of natural gas off the coast of Australia and shale gas in China. Similarly, shipyards in Korea and South East Asia have also been very busy with onset of mega projects in the region. However, there are a number of challenges the intumescent market is confronted with in the region.

## Overview of the Intumescent Coating Industry in Asia

The size of the intumescent coatings market in Asia (based on market reports) is estimated to be approximately €160 million, with a large part of that opportunity being the oil and gas market (hydrocarbon fire). The energy needs of countries within Asia are increasing by the day as the region's economy prospers, but the reality is that there are still millions living without access to electricity. Large investments are needed to secure reliable sources of energy.

In the construction industry, the opportunities for fire protection to structural steel lie in the



For example, a product price study of ultra-thin fireproofing coatings often shows prices can be equivalent to or less than the cost of the raw materials required to manufacture the coating itself. These low prices infer that inferior products are being used with the serious risk that manufacturers may substitute fire protection coatings with low price trade paint.

development of transportation hubs, commercial buildings, sports and leisure facilities, and tall buildings. Although steel usage in the construction market is steadily growing, the use of concrete remains dominant and favourable particularly in growing Asian economies.

The region is sensitive to price and therefore penetration of intumescent coatings as a viable, long term alternative to other forms of passive fire protection (PFP) like cement-based coatings is still far from ideal. There are a number of reasons why this remains a challenge.

Firstly, from a legislative standpoint, the hydrocarbon markets are far more safety conscious and regulated. They are driven by international standards such as ISO and UL, whereas the cellulosic or the built environment is largely governed by the local building codes and regulations. Secondly, there are numerous local companies in the intumescent coatings market that adopt aggressive pricing strategies not necessarily aligned with or complying with the international test standards and protocols. Such approaches have made the cellulosic market challenging for international intumescent coating suppliers. The trend to have unique local test standards and procedures together with the lack of enforcement of building codes has created a favourable environment for local suppliers to minimise risk in product development without having to comply to rigorous test procedures, but at the same time maximise the opportunity in high growth markets such as China.

Recent studies have indicated that there are over 1000 companies in China alone offering fire protection coating products for structural steelwork. The majority of these are private companies with differing levels of performance ranging from appropriate to sometimes questionable practice.

**The demand for structural steel is growing steadily in many developing countries in the Asia Pacific region, particularly in non-residential buildings. The demand for intumescent coatings in this region is also driven by large investments in the oil and gas sector, particularly with the recent discovery of natural gas off the coast of Australia and shale gas in China. Similarly, shipyards in Korea and South East Asia have also been very busy with the onset of mega projects in the region.**

### Building Codes

Building code effectiveness, their implementation and a strong regulatory environment is very important while designing and constructing a building. Not all countries in the Asia Pacific region have comprehensive building codes, and the ones that do often struggle with compliance and implementation within a weak regulatory framework. The recent fire tragedies in Bangladesh, India, and Pakistan have exposed the level of inefficiencies and lack of fire safety in public buildings in the region. One of the key issues the region faces is the lack of awareness among the general public. In certain instances, the authorities are not sufficiently trained or equipped to fight these death traps when they occur.

Historically, many countries in the Asia Pacific region have based their national building codes to comply with or align closely with British Standards. Several countries within Southeast Asia are now starting to adopt US-based design standards for fire safety such as National Fire Protection Association (NFPA) codes, the International Building Code (IBC) or derivatives of these.

Structural design codes have largely been based on British Standards although a number of countries are starting to recognise and adopt Eurocodes. With respect to structural fire design, the Eurocodes are globally recognised as the most advanced set of codes and precedents have been set for their use on projects considering a performance-based, structural fire engineered solution. Various countries in the region, including India, have held conferences as a part of global promotion of Eurocodes as they recognise no further updating of their equivalent British codes will happen.

The code or standard used to design the fire protection strategy for a building will state that materials used to achieve the required fire resistance must be tested in accordance with a specific fire test standard. Typically, this standard defines the definition and classification of fire-resistant coatings for steel structures including technical requirements, test methods, assessment criteria and specifications relating to packing, marking, labelling, storage, transportation and the product description.

The following standards are typically referenced and requested for intumescent coatings in the Asia Pacific region:

- BS 476 Parts 20-22 (Historically common due to the influence of British Standards).
- EN 13381-8 (Relatively new and comprehensive standard used across Europe).
- ASTM E-119/UL 263/NFPA 251 (US-based tests referenced to due increased use of US design codes).
- GB 14907 (Chinese fire test standard).
- GOST (Russia and CIS region).

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### Importance of Testing and Certification

Intumescent coatings must undergo a wide range of fitness for purpose testing, which includes fire performance to a stipulated fire curve, environment and durability testing and mechanical testing to assess their performance to a wide range of conditions and parameters.

In the majority of global fire test standards, the size and construction of a fire test specimen would ideally represent the element in its intended position in a building. In such tests, typically a loaded beam is tested horizontally, with protection applied to three sides and with the top flange directly in contact with a floor slab. Columns are tested vertically, with the protection applied to all sides. This leads to the terms “three-sided” and “four-sided” exposure when dealing with fire protection to steelwork. Such fire test standards define a test programme for unloaded sections to explore the relationship between fire resistance, coating film thickness and structural section size. A typical programme may include ten to 40 sections, including short beams, short columns and tall columns. To address the issue of adhesion to the substrate under deflection (stickability), additional loaded member tests are required to complement the unloaded member tests.

Methods of assessing the performance of fire protection materials have been developed that enable the thickness of protection for a wide range of situations to be predicted, based on a limited number of specimens as defined in a fire test. This approach can then be applied to the test results, which enables predictions of required coating thickness to be made for a range of structural sections.

Leading manufacturers also commit themselves to independent third-party verification and assessment of the test data via various schemes by reputable organisations to give confidence to the customers that the tested material is identical to that supplied for the project.

### Key Considerations for Specifiers

The specifier should consider the environment in which the intumescent coating system is going to be applied and also the environment it must withstand with respect to the life of the asset in question. Usually the life of the coating system is measured in terms of the years before first major maintenance as described in ISO 12944.

A range of intumescent coating technologies are available to choose from depending on the environment type and the expected design life of the system. Thin film intumescent coatings such as solvent or water-borne acrylics are generally suited for interior conditioned spaces, where as comparatively thicker epoxy coatings are more suited for aggressive exposed conditions.

An intumescent coating system has three main components: a primer, a basecoat (intumescent) and a sealer coat. In some cases the sealer coat may not be necessary. The primer assists with the adhesion of the basecoat to the steel, while the sealer protects against degradation of the basecoat. The basecoat is the key component that reacts to and provides protection from fire.

Intumescent basecoats usually consist of the following:

- A catalyst, which decomposes to produce a mineral acid. For example, ammonium polyphosphates are common catalysts.
- A carbonific, such as pentaerythritol, which combines with the mineral acid to form a carbonaceous char.
- A binder, or resin, simultaneously softens and helps char adhere to steel.
- A spumific agent that decomposes, to liberate large volumes of non-flammable gases such as carbon dioxide, ammonia and water vapour. The gases cause the binder to foam and expand to provide an insulating char many times the original coating thickness.

A typical specification for intumescent coating system will include:

- The steel substrate and its preparation standard e.g. Swedish Standard SA 2.5.

- The primer, its generic type and DFT (dry film thickness).
- The intumescent coat, specified along with the fire resistance rating required.
- The sealer coat, where applicable to include colour and finish.

The fire resistance rating required for the structural steel should be arrived at after understanding the requirements prescribed in the building codes and the recommendation from the approving authority. In some instances structural robustness in fire may be assessed by a competent structural fire engineer or specialist consultancy that has in turn justified and advised an alternate fire resistance rating required for all or part of the building in question.

In order to establish the correct intumescent basecoat thicknesses required to meet the specified fire resistance periods, the following information must be made available to a fire protection manufacturer:

- Required Fire Resistance Level (FRL) of the structural members.
- Steelwork drawings to show the elements to be protected.
- Steelwork section sizes and BoQ (Bill of quantity).
- Steelwork exposure e.g. 3-sided beam or 4-sided column.
- Environment exposure based on ISO 12944 classifications.
- Selection of the preferred application system (onsite or offsite).

In many situations, fast construction schedules can lead to a limited time for applying fire protection. On-site application is likely to cause disruption due to sequencing and construction schedules and could have a direct implication on cost. Evidence suggests that the most significant cost element in steel framed buildings is not the frame itself but the items built around and attached to it. Consequently any delays to the frame installation will delay the critical path and affect the project completion schedule.

The application dry film thickness (DFT) and drying properties of intumescent coatings is a function of time required for application. The DFT is a function of temperature at which steel is assumed to lose its ability to maintain its load-bearing capacity (also known as limiting or critical core temperature). In many parts of the world fire design methodologies allow designers to calculate the limiting temperatures based on structural calculations under specific loading combinations. This permits optimised DFTs for a given fire resistance period. This also means, in some instances especially at high fire ratings, intumescent coatings will become more acceptable to customers as the cost per installed unit area is lowered.

**The specifier should consider the environment in which the intumescent coating system is going to be applied and the environment it must withstand with respect to the life of the asset. Usually the life of the coating system is measured in years before first major maintenance as described in ISO 12944. A range of intumescent coatings is available to choose from depending on the environment type and the expected design life of the system.**

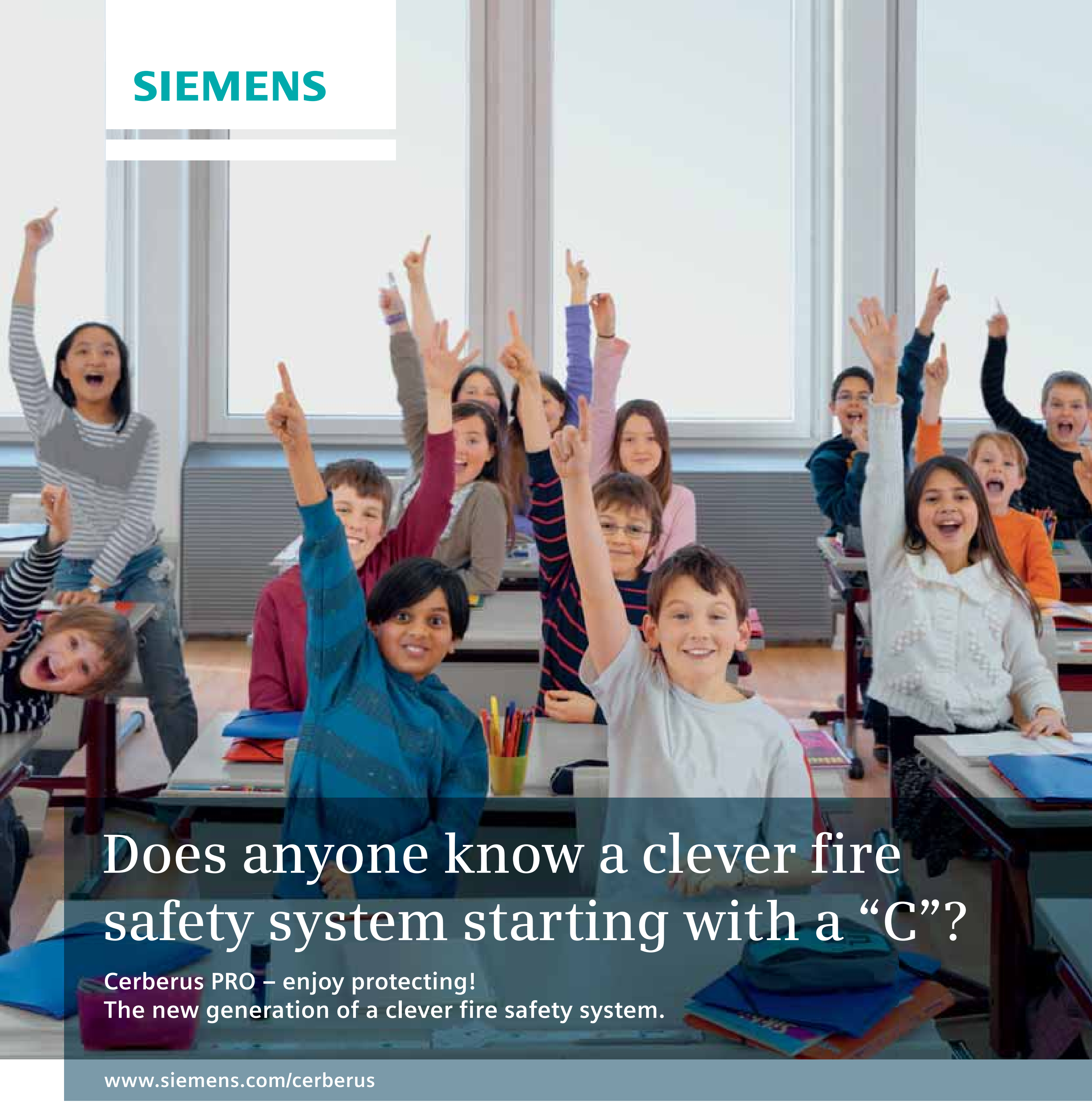
## Summary

Fire protection is an important life safety issue and warrants careful attention to detail at the planning and design stage of a project. Intumescent coating technology has evolved over the past decade to provide more efficient, cost effective solutions to customers around the world compared with other forms of passive fire protection. However, in certain parts of the Asia Pacific region there are still large knowledge gaps in this area, which has a detrimental effect on the industry. This knowledge gap needs to be addressed via sustained, effective and enhanced communication amongst key stakeholders.

Ensuring that a specification for passive fire protection to structural steel has been written correctly is very important. Specifiers are encouraged to open dialogue with intumescent coating manufacturers for advice on how best to select the most appropriate solution for their project. APF

**Srijith Nair** is Global Business Development Manager – Fire Protection and **Dr. Allan Jowsey** is Fire Engineering Manager at International Paint

For further information, go to www.international-pc.com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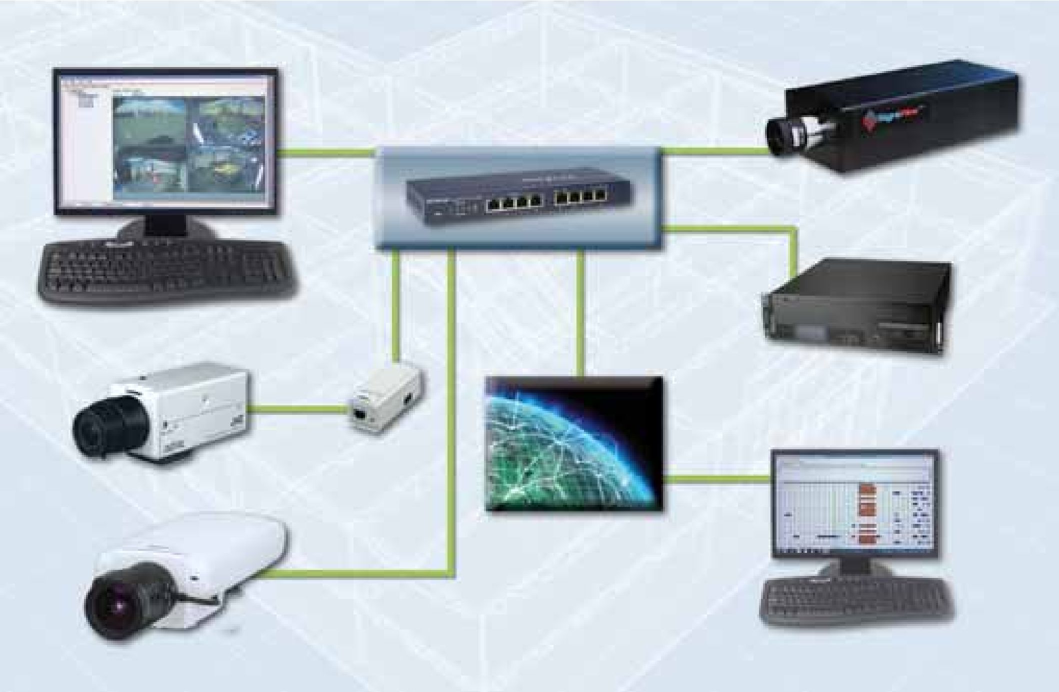


# Understanding Video Fire Detection

**Mac Mottley**

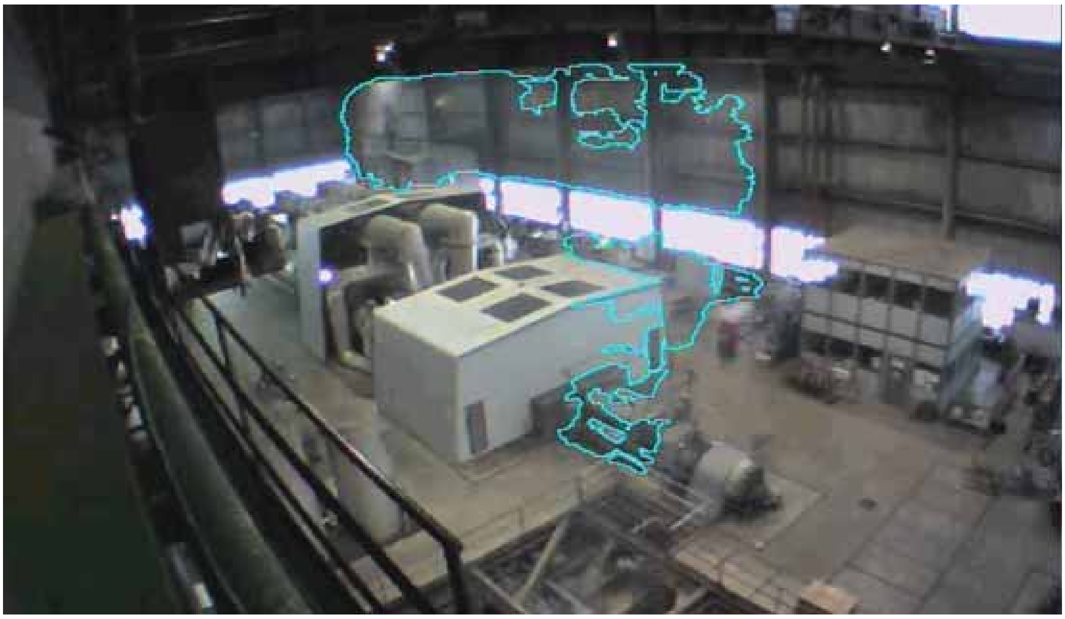
Fike Video Image Detection

Over the past decade, video image smoke and flame detection has made significant progress in the fire protection field. Video Image Detection (VID) is today widely used for flame and smoke detection in a number of industrial and commercial applications.

Video Image Detection is being used for its inherent advantages over what have typically been the standard available fire protection options. These include:

- **Sprinklers.** Sprinklers are typically mandated by code and are triggered based on high temperature. They are designed to save the building shell and prevent conflagration but, in most cases will not protect the contents of a building or provide final extinguishment.
- **Linear Heat Detectors.** Linear heat can be used as a pre-action for sprinklers and detection for industrial equipment and conveyors but are, again, activated by high temperature and will not detect fires at the early stage.
- **Beam Detectors.** Beam detectors are placed at ceiling level and can cause nuisance alarms based on blockage or misalignment. High ceilings can mean smoke stratification and diffusion issues.
- **Spot Detectors.** Spot detectors are usually either photo-electric or ionization and are placed at the ceiling level, which delays detection of smoke.
- **Aspirated Smoke Detection.** Aspirated smoke detection (where smoke is drawn through a series of tubes back to a central detector) is normally faster than spot and beam detectors but still can have issues with smoke stratification and diffusion as well as smoke transport time and installation costs.

Video image detection is used primarily in large volume facilities with high value assets based on its three primary benefits: early detection, situational awareness, and system flexibility. In fact, FM Global, a leading worldwide industrial insurance company that specialises in loss prevention services primarily to large corporations, publishes a Loss Prevention Data Sheet for Automatic Fire Detection (5-48) that states in paragraph 2.2.1.11: Use video-imaging fire detection systems for the following commercial and industrial applications: outdoor, open areas such as oil rigs, oil fields, mining operations, and forest products, and indoor locations such as industrial plants, boiler or other large vessel protection, turbines, and some clean/chemical rooms.



## Early Detection

Video image fire detection provides earlier detection because it processes video images from a camera using software-based analytics that can determine flame or smoke patterns. It basically "sees" fire at a distance and recognises that anomaly to be a fire event similar to a human's eye/brain combination.

Other detection technologies have to wait until some element of the fire (heat or smoke) reaches the detector. It is similar to a human's other senses, like your hands sensing the heat of a warm campfire, or smelling the smoke of burning toast. In both cases you need to be close to the fire event to detect it, whereas you can see a fire from much greater distance, so providing earlier warning. But just like a human, the camera needs to be able to see the fire, so care must be taken to position cameras so the field of view of the target detection area is not blocked (potentially using multiple camera locations) and also that the area is lit.

Cameras can detect smoke in very low light but there needs to be some minimal level, typically provided by some type of low power lighting like LEDs. Some manufacturers even use Infrared illumination that may be able to detect smoke in a dark area. Flame obviously produces its own light, but some fuels like hydrogen and some alcohols burn so clear almost to appear invisible to the camera and may not be detected.

## Situational Awareness

Using network video cameras as detectors provides instant situational awareness and security to personal. Video also reduces delays associated with verifying the presence of a fire before calling the fire department while also helping to immediately recognise a nuisance or false alarm.

Because the technology is deployed over a network the video can be accessed offsite, for example at a corporate headquarters. There are also email packages available that can notify a person anytime an alarm is generated, with a corresponding snapshot of the event, so you can maintain situational awareness through a smartphone. These video systems also continuously record video that expedites the reconstruction and cause and origin of the fire while deterring theft and arson, one of the leading causes of damaging fires. It is also increasingly significant to provide actionable intelligence to those in command during an emergency. Video image detection, along with floor plans, can provide fire department personal with the fire location and smoke conditions inside the facility.

## Flexibility

Some VID systems have multiple, functionally discreet algorithms that detect flame, smoke, reflected fire light and/or motion. Each of these algorithms can be enabled or disabled throughout the entire field of view or just in zones based on the hazard and environment. For example, an outside process area may be monitored with the flame detection algorithm enabled throughout the entire field of view, with one flame-blocking zone over the relief flare and others over potential areas of reflected radiant energy while other detection algorithms are disabled.

An additional feature for zones is scheduling. Zones can be set to turn off and on at different times of the day or days of the week, thereby allowing high smoke or flame detection sensitivity and motion detection at night-time or hours of low manning. Some facilities use the motion detection algorithm to monitor entry into normally unoccupied spaces for safety and security. Another scenario is the use of the VID cameras in an engine room or indoor process area with all algorithms of flame detection, motion detection, smoke detection and reflected fire light on, with a smoke blocking zone in an area of the field of view where steam may be present.

The smoke blocking zone can be set on a schedule for a plant running weekdays to be "on", blocking an area of steam during the daytime and "off" at night-time when steam is not present. Approved flexibility of VID detectors can allow their use in large areas as smoke detectors, replacing up to 20 spot type smoke detectors. VID smoke detection algorithms are commonly approved to detect a four-minute (calibrated smoke generator) at 30 metres based on a 90-degree field of view. This equates to a coverage area of 725 square metres and, since VID detectors are allowed a performance based design, one can extrapolate to 46 metres and increase the coverage to 1551 square metres. This detection can be supplemented with the other algorithms as needed as all are available in the camera software.

These benefits of video image detection have led to growth in protecting facilities in the following markets:

- Oil and Gas Facilities.
- Power Plants (coal and nuclear).
- Manufacturing facilities.
- Warehouses.
- Hangars.
- Cultural Properties.

## Embedded Analytics vs. Server Based

Typical video image detections systems installed in line with NFPA and other fire codes are self-contained detectors with embedded analytics capable of viewing and processing the image for flame and smoke. These types of cameras, like the SigniFire IP camera, can be listed to UL 268B (video smoke detection) and FM 3260 (radiant energy flame detection). These devices are powered in line with NFPA code and attached to a fire alarm control panel.

However a large portion of the target facilities do not require detection by code and rely on sprinkler activation for protection. The fires can be rather large and damage can be extensive even when a sprinkler system functions properly. For this reason it is advantageous to provide additional detection and early warning in these areas. Installing a code-compliant system can be a time consuming and expensive endeavour due to the fact that the system needs to be designed, installed and approved in line with the code.

With the introduction of an Open Network Video Interface Forum (ONVIF) many IP cameras now provide a standard communication interface. This open standard allows video management systems to accept and process a large number of camera makes and models. Manufacturers like Fike VID have used this opportunity to create video image detection servers. The server uses the same algorithms embedded on the UL and FM approved camera to process the incoming ONVIF video feeds for flame and smoke. This allows the end user to easily and cost effectively add flame and smoke protection to third-party cameras protecting areas not otherwise covered with early fire detection.

A VID server can be a rack mount computer running a Windows 7 operating system. The server is preconfigured at the factory based on licenses purchased to process 4, 8, 12 or 16 channels. Additional licenses can be purchased in the field to upgrade systems. Once physically installed, the manufacturer's standard user interface software can be used to configure the system.

The user interface will search for ONVIF capable cameras and once the appropriate password is provided the desired camera can be selected and added to the queue for processing. It is important to make sure that cameras have the latest ONVIF firmware from the manufacturer. For optimum detection, cameras should be appropriately focused, and not all camera views will be acceptable. It is best if the camera looks out into the hazard area covering the floor and ceiling where flame and smoke will exist respectively. Cameras looking outdoors, down at an angle, or covering a small area such as a cash register would not be ideal conditions.

Once the cameras are added to the VID server, the system is typically left for a two-week commissioning or calibration period. During this period events are stored so that sensitivity changes can be made limiting the false alarms. The detection algorithms can have various sensitivity levels (low, medium, high for example) as well as algorithm persistence delays, and the ability to mask or zone out portions of the image.

After commissioning, the system can be placed on line. Any number of computers can be loaded with the remote monitoring software that communicates with the VID server over a network allowing multiple users to view the cameras and incoming alarms. In addition, an intelligent I/O dry contact interface module can be set up to close on specified events, although this system cannot be attached to the fire alarm control panel by code, the contacts can initiate a warning signal or be incorporated into a SCADA system.

The VID Server can also be incorporated into third-party ONVIF compliant video management systems (VMS) as well. Each camera stream being processed by the VID server can then be accessed by the VMS as an ONVIF channel allowing seamless integration into an existing security system. VID alarms will be acknowledged as an event on the VMS system and handled as any other incoming alarm.

VID servers have been successfully deployed in power generation, industrial manufacturing plants, and facility utility areas (generator/engine /boiler/compressor) rooms. They now allow existing camera networks to serve a dual role as advanced flame and smoke detectors. The systems are easily installed and provide a relatively low cost investment to protect a facility from a catastrophic fire event using existing infrastructure.

In summary, VID flame and smoke detection provides advantages over other types of fire protection in large volume or outdoor facilities protecting high value assets or ensuring business continuity. The inherent advantages of early detection, situational awareness, and flexibility make VID flame and smoke detection an ideal choice for industrial and warehousing type environments. Today VID manufacturers offer code compliant, listed, self-contained detectors as well as server-based analytics capable of processing third-party camera networks. Applying VID flame and smoke detection to protect a facility can be a very effective risk management strategy to enhance a company's safety and security profile. APF

**Mac Mottley** is General Manager of Fike Video Image Detection

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# Safety Showers – Making the Right Choice

**Tony Hughes**

Hughes Safety Showers

When someone caught up in an incident involving potentially dangerous substances gets those substances on their clothing or bodies they need to wash them off quickly. Delays can result in permanent disability and, in some instances, even death.

A recent news story on the *Asia Pacific Fire* website once again highlighted the need for emergency safety showers where hazardous chemicals are handled. The second fire at a chemical plant in Shanghai in two days, which resulted in several injuries, has prompted the city authorities to launch a three-month campaign to warn of the potential hazards of handling chemicals. Such a campaign should always include advice on the provision of equipment such as emergency safety showers and eye wash units.

Every industry has its own materials and processes that can affect the choice of safety equipment. Extreme ambient temperatures will also place special demands on safety equipment. But, there are also some fundamental points to consider that apply to the choice of emergency safety showers irrespective of the industry or the location.

It is always wise to consult a specialist equipment supplier as early as possible. On new build projects, for example, they can offer advice that may affect plant layout and ultimately save having to make costly changes later to accommodate safety equipment.

## Importance of Standards

Compliance with recognised standards is also important and may be mandatory on some sites. The American National ANSI Z 358.1 2009 standard is widely recognised around the world and considered to be the most comprehensive. It provides guidance for determining the flow rate, duration of operation and water temperatures and identifies four essential requirements for safe and effective use of emergency safety showers and eye wash units.

### 1. Adequate Water Flow

Emergency safety showers with manual, not self-closing, valves should deliver a minimum of 76 litres a minute from a water pressure of 2.1 bar. Eye/face wash fountains should deliver 11.5 litres a minute with a flow rate of 1.5 litres a minute required for auxiliary aerated eyebath diffusers on a flexible hose.

### 2. Ease of Operation

Equipment must be both accessible and easy to operate, even if the victim has impaired vision. Hand-pull levers, panic bars or walk-on foot

controls can be used to operate a stay-open ball valve to deliver a continuous drench for 15 minutes. The victim must be able to remove contaminated clothing without having to hold on to a spring return valve. Similarly, for eye wash units, fast action is crucial with the water supply activated by pulling a handle, pressing a treadle foot control or pushing a plate with the head. For units that have an integral cover, the supply can be activated by simply lifting the lid. The unit should operate for 15 minutes leaving the victim's hands free to hold their eyes open.

**3. Instant and Positive Operation**

Speed is essential and the water supply valve must open quickly and simply as maximum flushing must be provided within one second.

**4. Reliability**

This type of equipment may only be used occasionally and must, therefore, be able to give its rated performance after standing idle for long periods. Valves with robust and corrosion-resistant actuating devices are essential for reliable operation. At Hughes, for example, we designed our own control valve when we could not find a suitable product to meet our requirements. When casualties are in distress, they often use excessive force to activate a shower. This inevitably leads to stress on the valve and the risk of premature failure if it is not designed to withstand such abuse.

## Choices

The choice of equipment has grown over the years as the more proactive manufacturers tailor emergency safety showers and eye wash units to the needs of a particular industry or location. Showers can be floor standing or, where space is restricted, mounted on walls or in the ceiling. Eye wash units can be mounted on walls, pedestals or work surfaces depending on the type of hazard.

The choice of materials for showers and eye wash units is also important. Galvanised, stainless steel or plastic pipework eliminates the risk of corrosion. Stay-open valves on the water supply ensure that casualties can remove clothing without having to hang on to the actuator bar or pull rod. It is the same if a foot panel is fitted. Step on, and the shower starts; step off and the shower still continues until manually turned off. Alarms, lighting and a choice of devices to activate the shower, such as pull rods, panic bars, chains and foot panels, can make showers easier to use and can alert co-workers.

Plumbed-in safety showers and eye wash units can be used inside or outside. The principal difference being the inclusion of some form of heating for frost protection on those exposed to low external temperatures. The term "heated" can be confusing; it simply means sufficient heat to prevent water freezing and not heating the shower water to give tepid water. Where the mains supply is unreliable or perhaps non-existent, emergency tank showers offer an effective alternative. They can also be fitted with heaters or chillers, depending on the climate, to provide tepid water between 16°C and 38°C as specified in the ANSI standard.

Maintaining a safe water temperature is essential if emergency safety showers are to be used properly. If the water is too hot or cold it could cause serious injury or shock and, in both cases, would prevent casualties from remaining under the shower long enough to complete the decontamination process.

## Handling the Heat

In hot climates, the water temperature in a tank shower can easily rise making it unusable. Consequently, some form of cooling is required. Insulation alone is rarely sufficient so manufacturers invariably supply some form of mechanical cooling system.

One of the most effective is a high-efficiency chiller attached to the side of the tank. Water constantly circulates through the chiller and when the temperature starts to rise the unit switches on to keep the water within the safe limits. The advantage of this type of unit is its flexibility, which means it can be supplied as part of a new shower or retrofitted to existing units. Flameproof versions are also available for Zone 1 Hazardous Areas. But, often, a centralised ring main system is more cost effective when several showers are involved. The cost of a centralised chiller unit feeding from outside the Zone 1 area can be less than the cost of providing individual tank showers each fitted with a chiller to a flameproof specification. Where high temperatures during the day are followed by cold nights, it may also be necessary to fit an immersion heater in the tank.

In hot climates, an alternative to emergency tank showers is the self-draining shower. When these showers are not in use, the water automatically drains from the standpipe to prevent it from being heated by solar radiation.

Regular testing is essential and operating a shower every week is important to make sure it is working properly. Draining water from the tank during testing will also help to reduce the risk of Legionnaire's disease, which is caused by a bacterium that can grow in static water between 20°C and 45°C. Further protection can be achieved by applying an anti-microbial coating to the inside of the tank – something that is now done routinely on all new tank showers at Hughes by spraying with our long-life EndoStat formulation.

### Out in the Cold

In sub-zero conditions, protecting casualties from the elements is as important as ensuring tepid water at the shower.

One solution has been to create what is termed a 'winterised booth' safety shower. Mains water is mixed with heated water from a thermostatically controlled cylinder to give the correct temperature at the shower head. The shower, invariably supplied with an integral eye wash, is enclosed within a heated booth. Double-skinned insulated doors and a space heater keeps casualties warm and protects them from the elements until help arrives.

### Eye Protection

Eye wash units should have some form of protection, such as a hinged lid that is ideally linked to the water valve so that the flow of water starts automatically when the lid is raised. Both hands are then free to assist with eye washing.

The diffusers also need to be protected against contamination and individual covers that 'pop off' under the pressure of the water as the unit starts operating are a simple but effective solution. Despite good design and diligent housekeeping, debris can still enter the system in the water supply itself so it is advisable to install an in-line fine mesh strainer on all eye-wash equipment.

### Installation and Training

Positioning is critical. It is no use having the best shower if it cannot be accessed easily. The ANSI standard suggests that no one should have to walk for more than ten seconds to reach an emergency shower. But, of course, if you are injured, disorientated or having difficulty seeing clearly, you are not likely to be walking at normal speed. Clear markings and high-visibility signs will help to guide casualties to the shower, which should be on the same level as the hazard, free of any obstructions and easily accessible.

### Servicing

And finally, do not forget servicing. It is not an option but a necessity to protect your investment in safety. Regular testing and routine servicing will ensure that your emergency safety showers and eye wash units are always ready for action. Daily inspection for mechanical damage and any obstruction to free access should be followed by weekly checks of the water flow. This not only tests for correct operation but flushes the line and confirms that the water supply has not been inadvertently turned off. Eye wash units should be tested daily and cleaned regularly. APF

**Tony Hughes** is the Managing Director of Hughes Safety Showers.

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*Photos courtesy of Airservices Australia*

**Rodd Sciortino**

Airservices Australia

# Aviation Rescue and Fire Fighting

Airservices Australia's aviation rescue and fire fighting (ARFF) is one of the world's largest providers of specialist aviation fire rescue services, responding to 9,000 aircraft and airport emergencies last year from its 22 fire stations at international, domestic and regional airports around the country.

A business unit of Airservices, a Commonwealth government-owned corporation charged with providing air traffic control services to 11 percent of the world's airspace, ARFF employs over 740 highly trained aviation firefighting personnel. Operating a fleet of the Rosenbauer Mk8 Panther ultra-large fire vehicles (ULFV), Morita turntable ladder platforms, domestic response vehicles (DRV) and specialised water rescue vessels, ARFF is larger than some Australian state and territory fire services.

The primary mission of ARFF is to rescue passengers and crew from an aircraft accident or fire. The service also provides airports with fire protection for its infrastructure including passenger and freight terminals, aircraft maintenance hangars and air traffic control facilities. As the first responders to all medical emergencies on airport, ARFF crews are trained in senior first-aid with advanced resuscitation techniques and automated defibrillator application training.

After knocking down any fire threat and completing the passenger and crew rescue during a major aircraft accident, ARFF hands over the response to another agency, likely the local metropolitan police, as the co-ordination authority taking the overall command of patient extraction and investigation.

Under federal legislation, ARFF must respond to an incident anywhere within the airport boundary, and up to one kilometre outside the fence, within two minutes and not exceeding three minutes from the initial call. This is no mean feat at some airports, such as Sydney, where around 900 aircraft, including the world's largest passenger aircraft – the Airbus A380 – operate daily across three runways and 31 kilometres of taxiways. In addition to the rapid response time frame, fire-fighting agent must be applied to have 90 percent of the incident under control.

An ARFF service is provided at airports that achieve over 350,000 passenger movements a year. Australia's aviation regulator, the Civil Aviation Safety Authority (CASA), dictate the required services category Airservices must provide at each airport. Ranging from Category 6 to Category 10, service categories are determined by the size of aircraft operating at the airport, the foam and water requirements, response times and discharge rates.

A Category 10 service involves a shift of 14 crew, four ULFVs carrying 32,300 litres of water and capable of discharging 11,200 litres a minute. Category 10 also requires an aerial ladder platform specifically for access to the upper deck of the A380. The aerial access comes in the form of the Morita MLK4-30 turntable ladder platform (TTLP), introduced into service in 2010. The Morita's

basket can carry three people and extend to a height of 31 metres.

At Sydney and Melbourne airports, Airservices currently provides a Category 10 service 24-hours a day with Perth and Brisbane airports expecting to upgrade to Category 10 within the next 12 months.

The mining resources boom has seen ARFF services reinstated at both Karratha and Broome airports, Western Australia, in 2009 and 2011, respectively. More recently, in June, Airservices reintroduced an ARFF service at Port Hedland, Western Australia, after withdrawing services there in 2003 following a steady decrease in passenger numbers, caused by a downturn in the resources sector. Currently operating from a temporary facility until a new, modular-design station is constructed, ARFF is providing a Category 6 service catering primarily for the fly in/fly out (FIFO) resource workforce.

Staffing in these remote locations has seen Airservices introduce its own FIFO option for its workforce. Not dissimilar to the resources sector it is serving, ARFF crews at Yulara, Northern Territory, Karratha, Port Hedland and Hamilton Island, Queensland, fly in on a “two week on, two week off” rotating roster, allowing staff and their families to maintain a lifestyle in larger city centres.

Several airports are on Airservices radar for the provision of future ARFF services. This is mainly due to the increased demand on the national air traffic network brought on by the tourism and resources industries. Gladstone, Queensland, and Newman, Western Australia, are in the early stages of being established with Ballina and Coffs Harbour, in northern New South Wales, while Paraburdoo, Western Australia, and Emerald, Queensland, are also being closely monitored.

Airservices is investing $140 million to modernise its ARFF infrastructure, including new or refurbished stations, new vehicles and vessels, and enhancing the fidelity of its training. This investment is part of Airservices almost $1 billion, five-year rolling capital expenditure program to modernise and update its national air navigation infrastructure.

In 2010, Airservices commissioned a new $8.6 million ARFF station at Perth Airport, Western Australia, replacing its aging facility there, and allowing for the future expansion of the airport. A new $5 million station at the Sunshine Coast Airport, Queensland, was opened in May 2010 and a $20 million combined air traffic control tower and fire station at Broome Airport was opened in July 2012, which brought together both air traffic controllers and aviation firefighters sharing the facility together under the one roof.

In April this year a $20 million specialised complex to support ARFF training capabilities and to equip its firefighters with the competencies required to deal with large, complex airframes was officially opened. The Learning Academy Hot Fire Training Ground (LAHFTG) at the service’s Melbourne Air Traffic Services compound features a hybrid Large Mock-up Unit (LMU) comprising of an Airbus A380 forward fuselage and a Boeing 767 rear fuselage with a MD-11 tail section. The training ground also comprises new classrooms and vehicle engine bays.

Previously, ARFF’s recruit and officer training courses were split between its existing training facilities at Melbourne as well as using a smaller LMU located at its Sydney Airport station. The LAHFTG not only centralises ARFF’s training in Melbourne, it also offers high fidelity training scenarios, strong environmental controls to substantially reduce the impact training has on the environment and provides a high level of consistency in the training delivery.

Throughout 2013, Airservices will hold four 11-week ARFF recruitment courses through the Learning Academy. At the time of writing, 50 new recruits have this year graduated and are now on-station. The final two courses of the year are expecting to graduate approximately 50 further recruits.

Airservices aviation firefighters, like all other Australian firefighters, are trained under the Australian Public Safety Training Competencies. A base firefighter leaves recruit course with a Certificate II in firefighting and attains the rank of Trainee Fire Fighter. Over the next few years recruits advance to the Leading Fire Fighter ranks and obtain a Certificate III in firefighting.

The first step towards becoming an officer in ARFF is the Certificate IV in firefighting supervision, which, on successful completion, holds the rank of Sub Station Officer. Station Officers and Fire Commanders in ARFF are qualified to Diploma of Fire Management. Senior Fire Commanders and above are qualified to an Advanced Diploma level.

Additional services means ARFF is looking to bolster its Mk8 fleet to meet the service requirements. Currently Mk8 vehicle numbers 76, 77 and 78, out of an initial order for 80, are in the final acceptance testing phase at Rosenbauer’s factory in Austria. Once accepted by ARFF emergency vehicle technicians the Mk8s are then shipped to ARFF’s engineering facility at Brisbane Airport for final fit out and registration before being deployed to station.

Fully laden, the 30-tonne Mk8 Panther carries 8900 litres of water, 1340 litres of foam and 225 kilograms of dry chemical powder. Powered by a 665hp six-cylinder Detroit 60 DDEC IV power train, the 6x6 all-terrain Mk8s can reach a speed of 80kilometres-an-hour in less than 20 seconds.

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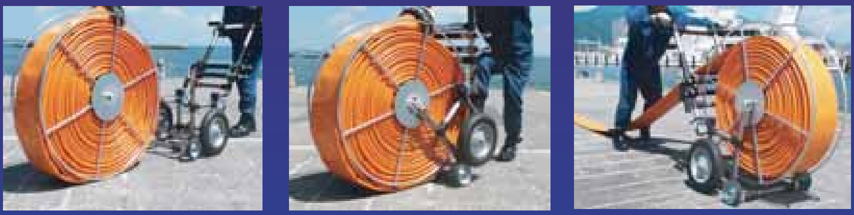

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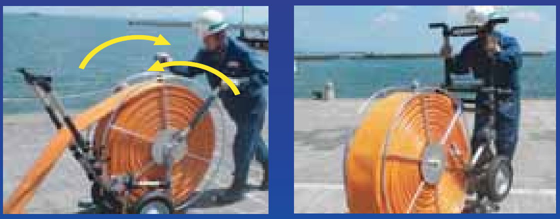

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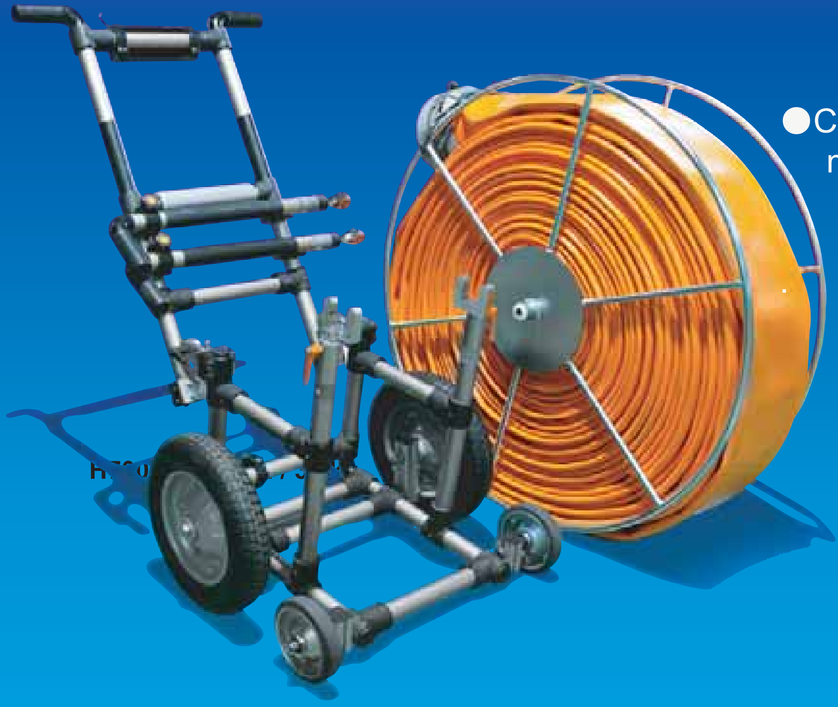

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a dedicated DRV capability for these responses. In essence, the DRV is an urban type fire pumper and is usually one of the busiest vehicles on station. The DRV is fully equipped with rescue, structural firefighting and emergency medical equipment usually found on urban fire tenders. DRV staffing is maintained above what is required for category, meaning the large number of domestic responses do not interfere with ARFF maintaining airport category.

The community, and the media, often identifies ARFF as belonging to the local metropolitan fire service or operated by the airport. Airservices has been actively trying to turn the tables on this perception and create greater community awareness of what ARFF is and its role, as well as attaining the appropriate recognition the specialist fire service deserves.

ARFF vehicles regularly operate on public roads around the airport, and away from the airport when providing mutual aid assistance to metropolitan brigades. The unfamiliar shape and colour of the vehicles have left some unsure of their activity and purpose. In fact ARFF vehicles are considered under state and territory laws to be emergency vehicles and require the same respect on the roads as police, fire and ambulance vehicles.

In 2008 Airservices changed its vehicle colour from the traditional 'signal red' following a rise in airside safety incidents including runway incursions, where vehicle colour was attributed as a factor. Airservices and CASA reviewed the colour requirements for airside vehicles and overwhelmingly favoured 'yellowish green' as the safest colour providing optimum visibility under variations of light encountered during a 24-hour day influenced by weather and seasonal changes. The change of colour also aligned with the International Civil Aviation Organization's requirement for all airside emergency service vehicles to be yellowish green.

Apart from the Australian Capital Territory Fire & Rescue in the nation's capital of Canberra, Airservices ARFF vehicles are the only other emergency service vehicles painted yellowish green. Deliveries of all new Mk8s for Airservices since 2008 have arrived with the yellowish green colour scheme. The existing fleet of signal red vehicles is being repainted as it goes through vehicle refurbishment, with only a handful of signal red Mk8s remaining on stations.

ARFF has been a dedicated airport fire service since 1947 and has a proud 66-year history of protecting Australian aviation. The next three years will certainly be busy ones for ARFF with new stations expecting to commissioned, the commencement of a vehicle replacement program and the need to recruit around 240 new firefighters to bolster its workforce at its existing or new stations.

With statistics suggesting 70 percent of all aircraft accidents occur at an airport, the highly trained and well-equipped fire crews of Airservices ARFF are on standby to respond anywhere on and off the airport within three minutes of the call for help.

The Mk8's primary strike weapon is its roof-mounted monitor, capable of discharging at a rate of around 80 litres a second and firing agent over 80 metres. Mounted on the front bumper is the smaller, yet effective bumper monitor. Combined with a forward looking infra-red camera, the bumper monitor discharges at a rate of 40 litres a second over 45 metres and is a useful tool in the post-knock down process.

ARFF's Hamilton Island, Queensland, station is equipped with three slightly smaller and lighter Panther Mk9s. The dual-axel Mk9 carries 6100 litres of water, 921 litres of foam and features the same engine and gearbox and crew cabin as the Mk8. The Mk9 was specially chosen for Hamilton Island because of its lighter gross weight, compared with the Mk8s, enabling the vehicle to negotiate the airport's soft, sand-based access roads and open areas without causing damage to the surfaces. ARFF has a fourth Mk9 permanently located at Brisbane Airport used for Hamilton Island crew training.

Airservices will soon commence a vehicle replacement program to update its Mk8/9s currently in service as part of its regular vehicle replacement cycle and to cater for expected new services. Airservices is currently working with the International Civil Aviation Organization (ICAO) and other international aviation rescue operators to determine future vehicle requirements focusing on the amount of agent that will be required to be carried.

With a number of airports around Australia in close proximity to, or having runways oriented for aircraft movements over water, ARFF maintains a water rescue service (WRS) at Sydney, Brisbane, Cairns, Hobart, Adelaide, Broome and Townsville airports. The size and types of vessels ARFF employs varies between the WRS-capable stations. Larger WRS vessels carry up to 12, 20-person Aviation Rescue Platforms (ARPs) between them allowing for 240 passengers to be rescued from the water to wait further rescue. Additional ARPs are kept available at the station for deployment. ARFF's WRS are also available to respond to maritime emergencies near the airport.

A large number of ARFF's daily responses, nationally, are to domestic incidents, including medical first-aid, automatic fire alarms at airport buildings and to motor vehicle accidents on or around the airport. Larger ARFF stations maintain

APF

**Rodd Sciortino** is Manager National Operations, Aviation Rescue and Fire Fighting at Airservices Australia

For further information, go to www.airservicesaustralia.com

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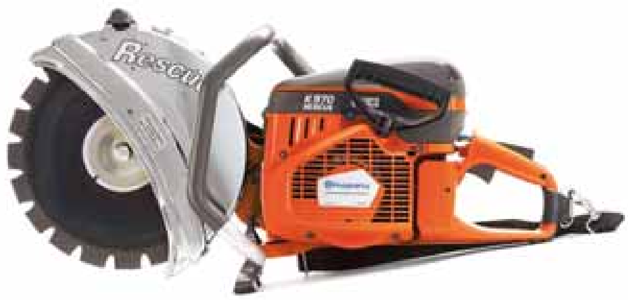
*Adjustable carry strap allows full freedom of movement*

*Specially designed starter handle, with room for heavy gloves.*

*Chromium-plated blade guard, visible in smoke and water spray, enhances control of the cutter.*



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# Challenges for Very Early Warning Smoke Detection

The ability to provide early and accurate alerts is the critical objective for any fire detection system – and achieving that value is the primary challenge for our industry. But early detection brings with it other, less obvious, benefits.

**Peter Meikle**

Xtralis

Quick, accurate assessment of potential fire situations ensures alarms reported upstream to emergency service responders are genuine. False or nuisance alarms from automated alarm systems are widespread, in some cases up to 90 percent, and costly to the community. They can also be costly to businesses, with many municipalities levying fines against companies reporting false alarms.

Most importantly, however, false alarms mean that valuable emergency service resources and personnel are deployed needlessly, perhaps when the call for them elsewhere is genuine.

In short, improving fire detection is good business, and a mark of good corporate social responsibility. Choosing the most efficient and effective fire detection system requires selecting from a range of technologies, none of which is perfect.

## False Alarms: The Cost to Business

For the business owner, the cost of even a single false alarm can be substantial. In New South Wales, Australia over 21,000 nuisance alarms occur every year with a fine of $750 levied against the property owner; a fine set to increase.

Staff have to be evacuated, and systems may have to be shut down. Customers and clients cannot or will not make allowances for apparent emergencies so, inevitably, business is lost.

There are also other, more insidious, effects. Too many false alarms may lead some businesses to isolate detectors. Frequent false alarms can cause staff to become complacent. The result, should a fire occur, could be disastrous.

Detector longevity and reliability are important considerations when selecting appropriate smoke detection systems. Performance can be affected by environmental conditions including dust, smoke, airborne particles, and plant wash-down. If a detector's performance is affected by any of these conditions then lives, assets and business continuity are also put at risk.

Early and accurate detection must be allied with other considerations, including ease of installation and maintenance, and the cost of replaceable parts. Performance over time and in different environmental conditions must also be researched exhaustively.

## Advantages & Limitations of Current ASD Technologies

Aspirating Smoke Detectors (ASDs) operate by drawing air through sample holes in a pipe network into a detection chamber for analysis. ASD detectors are generally highly sensitive and provide very early warning of a potential fire at the incipient stage of fire development. Systems are monitored for airflow faults, providing warning if sample holes become blocked or a pipe is broken.

Most ASD systems provide multiple alarm levels that may be configured across a wide range of sensitivities. The benefit is earlier notification of a developing fire allowing investigation and manual intervention at the smouldering stage and it allows for the subsequent activation of suppression release systems if required. This increases the time available for evacuation, and minimises potential fire damage.

## Detection

Light scattering, used in photoelectric – or optical – detectors is commonly found in point type and ASD detectors. This technology uses a light source, a lens to focus the light into a beam, and a photodiode (or other sensor) angled to the beam to detect the scattered light in the presence of smoke. Commonly the light source used in an optical detector is an LED or laser.

Lasers emit "organised", or coherent, light allowing more accurate focussing of the light source and reduced drift over both temperature and time, eliminating the need for drift compensation. This yields a more reliable response to slow growth fires. The ability to better focus laser light sources also allows higher intensity light in the detection chamber and a higher sensitivity detector. Some detectors use dual-wavelength optical detection technology, intended to distinguish between smoke and dust. In early stage smouldering fires the size of dust and smoke particles can be similar, leading to large particle smoke being rejected as dust. Where the optical path is long and high sensitivity is secondary, such is the case with beam type detection, this method provides satisfactory performance.

## Maintaining ASD performance

Industrial environments such as manufacturing, power generation, mining and even large cities often have high levels of background (ambient) smoke or dust. This can challenge some ASD systems, which must maintain reliable and consistent performance over time while avoiding nuisance alarms.

Different ASD technologies employ various techniques to address such environmental conditions including software algorithms or mechanical measures, such as filtration, to protect optics from contamination, compensate for drift and reduce nuisance alarms.

## Optics Protection

ASDs may use external filtration to remove contaminants from sampled air before it enters the detector, and ideally employ clean-air barriers to protect detector optics from contamination and degradation of sensitivity. Without clean-air barriers, some ASD systems employ drift compensation, relative sensitivity algorithms, or both.

## Drift Compensation

Smoke detectors that do not provide appropriate optics protection are vulnerable to contamination induced drift. Electronic components may also be subject to the effects of ageing, or in the case of some LEDs, temperature. To compensate for drift, and minimise nuisance alarms, these detectors employ algorithms that ultimately make the detector less sensitive and may increase the time needed to detect smoke.

Drift compensation may force a near new detector to respond like a contaminated or aged detector when sampling in environments with near constant background pollution levels. Drift compensation may severely impact the sensitivity of a smoke detector and early warning reliability.

## Relative Sensitivity

Relative sensitivity or automatic alarm threshold algorithms modify alarm thresholds based on background smoke conditions in order to maintain a margin of safety from nuisance alarms. However, in slow-growth fire scenarios a detector may automatically adjust its alarm thresholds to a less sensitive level as very slowly increasing smoke levels are indistinguishable from background pollution or contamination. The result in tests has been delays approaching two hours, and may result in potentially disastrous delay in detecting a real fire.

## The Panacea: What's Missing from the Ideal Detector?

An ideal detector would provide accurate very early warning of fire events in the presence of high levels of nuisance alarms sources.

Absolute calibration and detector stability are superior to drift compensation or relative alarm sensitivity. Fixed alarm thresholds and clean air barriers to protect the optics of a detector is the closest ASD has come to exhibiting absolute calibration and allowing stability at very low alarm thresholds over the life of the product.

An intelligent detector that could distinguish between substances such as dust, smoke, and steam, could considerably reduce the time needed to accurately identify, verify, and deal with an incipient event, mitigating loss. Similarly, the ability to "fuse" data, such as the presence of smoke and different gas species, would be a valuable decision support in emergencies.

Addressability combined with very early warning is another highly desirable feature in smoke detectors. ASD systems with addressability to 15 detection points are already able to provide very early warning of the exact location of an incident in facilities such as high-rise buildings, educational campuses and hospitals, aiding evacuation, and minimising loss and downtime. The challenge is to help specifiers reconcile the initially higher capital cost with superior performance, utility and reduced operational expenditure.

## Conclusion: The Search for the Optimum Continues

At present, no smoke detector on the market can match every challenge, although ASD comes close in many regards. Some of those challenges have been partially met, while others await even basic solutions. Additionally the wide range of codes and standards that need to be observed in the deployment and operation of very early warning fire detection systems impose a multitude of requirements.

The combination of specific, aggregated and enriched data and improved connectivity would allow integration of intelligent detection to building management and other systems, including remote monitoring and verification, such that data from a multitude of sources can be used to create true, actionable information on threats.

Industry participants believe recent advances in technologies governing very early warning systems might soon provide the long-awaited game-changer. A flexible detection system, which combines very early warning fire and other data sources, may provide the next step in improving detection performance in challenging environments while near eliminating nuisance alarms. **APF**

**Dr Peter Meikle** is Vice President Product Line Management & Competitive Strategy at Xtralis

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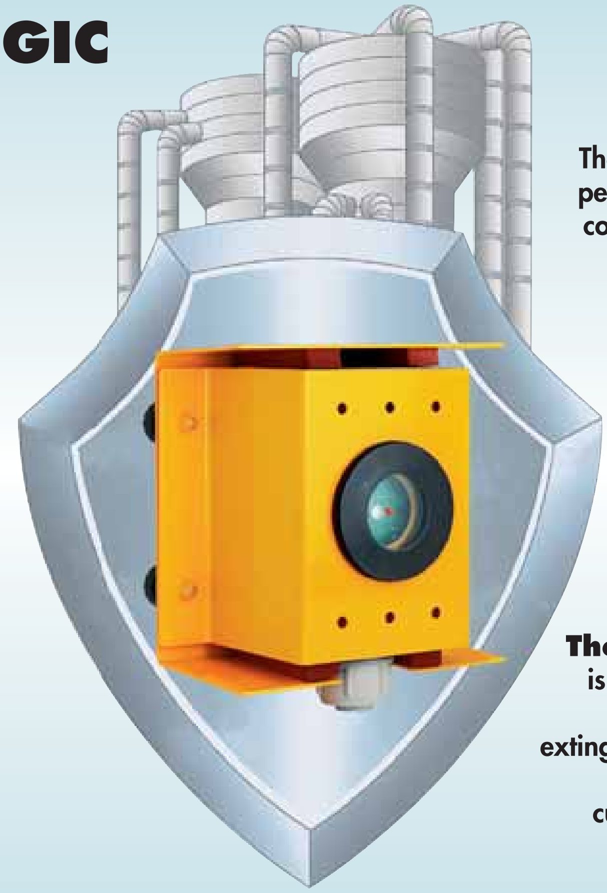

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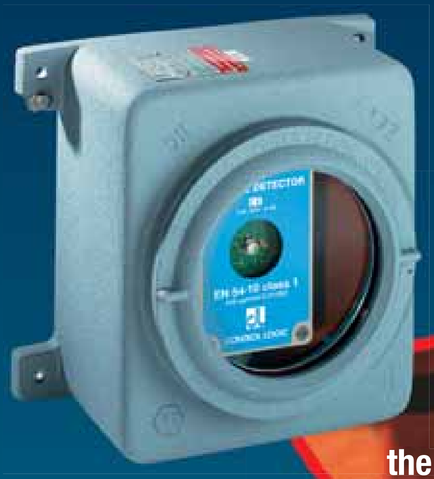

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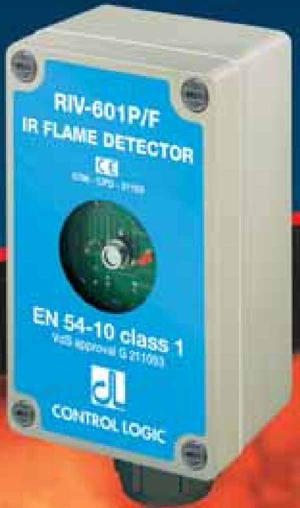

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# What Do Recent ICAO Fire Test Changes Mean For Airports?

**Mike Willson**

Willson Consulting

Proposed changes to ICAO (International Civil Aviation Organisation) Level A, B and new Level C fire tests have now been ratified, and will be implemented in November 2013. But what does this really mean for Airport operators and firefighters? Will it perhaps increase fire safety and reduce risks by gaining control faster with less foam used from the first attack vehicle and reduce risk of fuel pick-up and sudden flashbacks? Will it meet a key objective of requiring smaller trucks, fewer crew and thereby create efficiency savings and reduced operating costs, or could it potentially erode safety margins and dilute performance standards? Perhaps some complex mixture, so let us investigate in more detail to try and better understand the likely outcomes.

For most fires the objective is clear, to extinguish the fire before safe rescue commences.

The ICAO Airport Services Manual Pt.1 (Doc 9137) confirms that the main operational firefighting objective for aviation is to control any fire occurring, but not necessarily extinguish before rescuing survivors can begin. Unwarranted delays or potential risk to survivors may result from extinguishing all flame before rescue begins. Accordingly ICAO defines a Theoretical Critical Fire Area (TCA) as the length of the aircraft fuselage plus an extension of area based on upwind and downwind potential involvement, related to aircraft size.

In practice seldom is this entire TCA on fire, so firefighting efforts are focussed on a smaller target closer to the fuselage and exits, called the Practical Critical Fire Area (PCA), typically around 66 percent of TCA, based on analysis from actual aircraft accidents over time.

## How Does the US Mil-F Spec Compare?

US airports use Federal Aviation Administration regulations requiring compliance with the US Mil F24385F specification (Mil spec.) where some lower test application rates are required, compared to ICAO Level B, but similar to this new Level C, as shown in the Table on page 58.

Hence the sensible exploration of whether

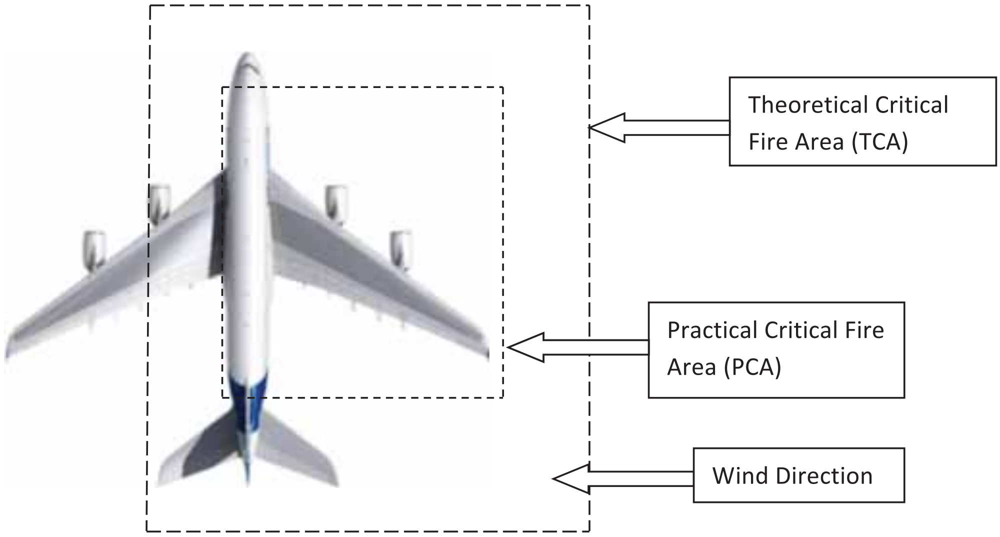
Theoretical Critical Fire Area (TCA)
Practical Critical Fire Area (PCA)
Wind Direction

*Diagram of Theoretical and Practical Critical Fire Areas, relative to a large fixed wing aircraft*

*Comparison of 3% foam requirements for Mil spec. against the new ICAO Level C fire test.*

| Criterion | US Mil F 24385F spec. (3%) | ICAO Level C (3%) |
|---|---|---|
| Fire tray shape and area | Circular 28ft$^2$ (2.6m$^2$) and<br>Circular 50ft$^2$* (4.64m$^2$) | Circular 7.32m$^2$ |
| Fuel type | Unleaded gasoline | Avtur Jet A |
| Fuel quantity | 10 galls (37.85L, over water base – not specified) 28ft$^2$<br>15 galls (56.77L) on 50ft$^2$ | 157L fuel (over 157L water base) |
| Foam nozzle & flow rate | Mil spec 2 gall/min (7.5L/min) | UNI86, 11.4L/min |
| Nozzle pressure | 100psi (7 bar) | 6.3-6.6 bar |
| Application density | 0.07g/ft$^2$ (2.92L/min/m$^2$) 28ft$^2$<br>0.04g/ft$^2$ (1.64L/min/m$^2$) 50ft$^2$‡ | 1.56L/min/m$^2$ |
| Foam solution temperature | 23°C ±5°C | ≥15°C |
| Nozzle movement | Complete freedom of movement | Fixed position |
| AFFF foam % | 3%, 1.5% (lean)†, 15% (rich)*† | 3% |
| Fire pre-burn | 10 secs | 60 secs |
| Water quality mixed with foam | Fresh & Sea | Fresh only |
| Foam application time | 90 secs | 120 secs |
| Extinction time (pass) | 30 secs (3%), 45 secs (1.5%), 55 secs (15%); 50 sec on 50ft$^2$ | 60 secs with flickers |
| Totally extinguished (pass) | 30 secs (3%), 45 secs (1.5%) 55 secs (15%), 50 secs 50ft$^2$ | 120 secs (no flickers) |
| Burnback pot location | 0.3m dia, 50mm tall, 1 gall ULG (3.785L)<br>Centre tray | 0.3m dia, 200mm tall, 2L ULG/JetA<br>Centre tray |
| Burnback pot ignition | 60 secs after end foam application | 120 secs after end foam application |
| Burnback re-involvement (pass) | ≤25% tray area in 6 mins (3%), 5 mins (1.5%), 3.3 mins (15%)<br>≤25% tray area in 6 mins (50ft$^2$) | ≤25% tray area in 5 mins |
| Film formation & sealability test | ✔ | NR |
| Physical property requirements | ✔ | NR |
| Compatibility with all other QPL listed products test | ✔ | NR |
| Compatibility with Dry Chemical test | ≥6 mins burnback | NR |
| 4 metals corrosion test | Specific rates allowed | NR |
| Fluorine content | Measured | NR |
| Halides (salt) content | ≤500ppm | NR |
| Aquatic toxicity test | LC50 ≥500mg/L | NR |
| Biodegradeability, BOD/COD | 20 day Biodeg. 65%,COD ≤1,000k mg/L | NR |
| Compliant container spec. | ✔ | NR |
| Qualification on Products List (QPL) as acceptable for use | ✔ | NR |
| Strict label requirements | ✔ | NR |

Key: * = seawater test only; †= 28ft$^2$ test only; 🟨 = Easier; 🟥 = Harder; NR = Not Required; ‡ = same as UL162 fire test.

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equivalent foam efficiency savings are possible under ICAO regulations with the development of this Level C specification.

The comparison above shows some clear differences, which make it hard to directly compare. However an assessment has been made of sections of each test, to determine which is generally likely to be harder or easier to pass (focussed on the 50ft$^2$ Mil spec test). While unleaded gasoline is not directly used to fuel modern jet aircraft, any foam working effectively on this volatile fuel is likely to handle kerosene products like Avtur. The very short ten-second pre-burn period under Mil Spec. means the fuel and tray edge have little chance to get really hot and potentially cause difficulty sealing round the tray edge. The USA's Hughes Associates assessed the shorter 50-second extinguish time as producing a lower 50ft$^2$ "extinguishment application density"(EAD) of 1.36L/m$^2$. The 60-second pre-burn time for kerosene does permit the metal tray edge to get hot, and potentially makes it harder for foams to seal around the tray perimeter, and the fixed position nozzle also makes it very tough. The new allowance of flickers at the intended extinction time of 60 seconds weakens this impact, evident from an EAD, assuming a 75-second extinguish time (Level C), extending to 1.95L/m$^2$, possibly more.

The inclusion of seawater (required for naval operations) on the 50ft$^2$ fire undoubtedly makes any fire test more challenging, particularly when the summation of percentage extinguish areas at four stages during the 50ft$^2$ fire must also meet specific criteria. Certainly undergoing half strength, over-rich and mixture of agent fire tests, adds a level of difficulty and consistency requirement that exceeds the new ICAO Level C requirements.

Extra metal corrosion, dry chemical compatibility and environmental performance requirements add complexity and difficulty to achieving a Qualified Product Listing (QPL) under Mil spec. In discussion with a fire testing professional, it appears they are probably generally of similar difficulty. If the Level C required extinction in 60 seconds this may be the harder test, but with edge flickers permitted to 120 seconds the US Mil spec is probably marginally harder for a foam concentrate to pass, even though the actual fire tray area is smaller, pre-burn significantly shorter and full nozzle movement available.

Modern preferences for indoor testing deliver greater consistency, but it also insulates the fire from natural wind effects, so ironically conducting the Level C test outdoors may enable more products to meet the original 60-second extinguish criteria. This could also help explain why the large scale outdoor tests were extinguished around 40 percent faster. Some readers may disagree, but this is probably the best impartial assessment we can make, without conducting independent side by side indoor fire testing.

## New ICAO Level C Protocol

Such a high performance focus could increase speed and likelihood of passenger and crew being safely rescued from the plane, even though flames may still be active outside the PCA. The target was to achieve 25 percent to 30 percent less foam agent on fire vehicles, so instead of using the current 5L/min/m$^2$ foam application density commonly used by Aircraft Rescue and Fire Fighting (ARFF) Services across much of Europe, Middle East, Africa and Asia, the possibility of 3.5L/min/m$^2$ (still over double the fire test), could be achieved, with associated operational savings being available.

Achieving Level C was always likely to require a three-fold increase in fluorotelomer surfactant levels (a key ingredient in AFFF foams) according to one manufacturer, indicating just how tough it is to pass this new Level C test. However it confers more reliable resistance to fuel pick-up, less risk of sudden flashbacks and re-involvement, which could put firefighter safety at risk when they are not present.

Acceptance of fluorotelomer surfactant foams in this test perhaps also underlines how much closer the environmental performance of C6 fluorotelomer surfactant-based foams are to fluorine-free foams, and very different from PFOS now banned from use across the European Union, and PFOAs over which concerns continue. C6 fluorotelomer surfactant-based foams cannot degrade to PFOS or PFOA and are proven effectively non-toxic and non-bioaccumulative.

As aircraft get larger, so does this PCA, requiring more fire trucks and personnel to attend an incident using Level B approved foam concentrates. Adding this new Level C could potentially reduce required foam quantities, particularly when 3% concentrates are used, along with associated reduced water demands, possibly less equipment, less run-off, potentially smaller fire trucks, with fewer crew for rapid first intervention at a future large "super-jumbo" aircraft incident, which could help save more lives.

In an effort to achieve such increased firefighting efficiencies an extensive range of fire tests was conducted at the CNPP (Centre National de Prevention et Protection) test facility in France. 28 samples were submitted from eight manufacturers. Only one of those concentrates was reported to have met the extinguishment requirement of 60 seconds, while several extinguished within 120 seconds. Around a 500m$^2$ fire test replicating a large aircraft, PCA was also conducted on a product at Level C application densities, which seemingly extinguished significantly faster at the larger scale. This provided confidence about safety at a practical ARFF level, and supported the capability of adequate control with fewer vehicles responding.

Consequently the Level C test is recently formalised delivering 38 percent lower application densities (1.56L/min/m$^2$) over the more familiar Level B (2.5L/min/m$^2$). It still uses a circular tray with a 63 percent larger fire area of 7.32m$^2$, requiring 157 litres of Avtur Jet A fuel (Kerosene). Foam application from a pre-mix vessel uses the current UNI86 foam branch-pipe delivering 11.4L/min, but maintains a fixed position one-metre above the upper edge of the fire tray and at a distance that ensures the foam falls into the centre of the tray, avoiding variations in operator technique. Already we see at least two products with ICAO level C certification, maybe we will see Mil F QPL products also meeting Level C certification in future.

Interestingly at each of the three performance levels the ICAO standard now defines: "a foam concentrate is acceptable:

- If the time to extinguish the fire from the overall surface of the tray is equal or less than 60 seconds and;

- The re-ignition of 25 percent of the tray surface is equal or longer than five minutes.
- Yet a critical extra note has been added: "Note for testing Authorities: At the 60 seconds time, minute flames (flickers) visible between the foam blanket and the inner edge of the tray are acceptable:
- If they don't spread in a cumulative length exceeding 25% of the circumference of the inner edge of the tray and:
- They are totally extinguished during the second minute of foam application."

So hang on, it is not extinguished until it is totally extinguished, which is different from extinguished, yet surprisingly nowhere in the document are these changed meanings clarified. The Oxford English Dictionary defines extinguish as *"cause a fire or light to cease to burn or shine; put an end to; destroy; or render void"*, so why this change?

Extinguish in ICAO parlance now seems to mean "not extinguished" to the lay person, as it includes small flames or flickers and only "totally extinguished" means no flames (that is, extinguished). This is an unfortunate anomaly probably linked to critical fire area concepts, but could have adverse impacts, particularly at Level B in future.

## Exposure Risk Increases at Level B?

In view of this PCA concept, it is perhaps the use of fluorinated surfactants over many years that has helped to ensure effective fire control while minimising the risk of escalation and sudden flashbacks that may otherwise occur during aircraft incidents from fuel still flaming at the margins. It is therefore re-assuring that any newly approved Level C foam concentrates may require higher levels of fluorocarbon surfactants than current Level B approved concentrates, which may be fluorine free.

ARFF response times have historically been based on the survivable atmosphere inside the fuselage during an external fuel fire being three minutes, assuming no fractures. Specialists confirm fire also takes three minutes to burn through an undamaged fuselage, so rapid fire control to rescue survivors is critical. Until recently NFPA 403 required a response time of two minutes, allowing a further 60 seconds to apply foam and control the fire, before survivors could become asphyxiated, suffer potential burn through, or both.

This underlines the historical importance of the 60 seconds or less extinguishment requirements under both ICAO and Mil spec. However we now see dilution at Levels A, B and C with extinction extended to 120 seconds. NFPA 403 response times slide out to three minutes, so likely fire control times may increase, likely foam quality may decrease with relaxing ICAO level B test criteria, which would seem to be eroding safety margins for any survivors and emergency responders. Is that acceptable?

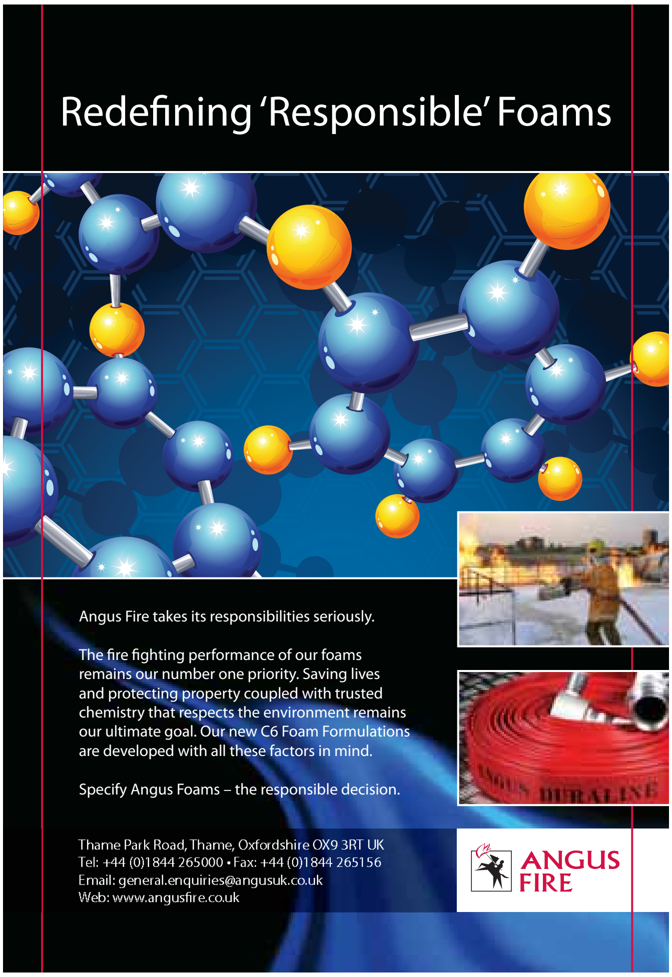
Exposure to extra risk comes with forceful application of F3 foams, for without fluorinated surfactants more detergent is required to achieve adequate performance. This attracts more fuel pick-up into the forcefully applied F3 foam blanket. As the bubbles begin to collapse, fuel vapour is released at the surface which can lead to sudden flashbacks and re-ignition from incandescent materials, or a still flaming area outside the PCA. Casualties or firefighters could be exposed to adverse impacts during rescue operations, increasing their level of risk. Similarly, allowing persistent edge flickers up to 120 seconds, will inevitably allow previously unacceptable and inferior AFFF foams to pass this diluted Level B test, potentially reducing safety for everyone.

Perhaps upgrading to C6 Level C products, where less foam and water resources are being used for a given sized incident, or C6 Mil F approved products, where post fire security and minimal fuel pick up are assured, would help to redress this balance.

## Conclusions

Perhaps we are seeing a polarisation within ICAO. A new high performance Level C fire test that seems only achievable with more fluorochemical ingredients, yet potentially delivers significant operational savings with less foam and water on wheels, requiring smaller fire trucks with potentially fewer crew. Yet we also see a "dumbing down" of Level B performance with edge flickers now being allowed up to 120 seconds, inevitably resulting in previously unacceptable products now becoming accepted. NFPA 403 lengthening response times adds to this general eroding effect. Tough decisions ahead face airport operators, a few having already gone down an F3 path at Level B. Is that wise when C6 fluorotelomer surfactant-based foams and F3 products are more comparable than ever environmentally, and Level C would seem to deliver advantages in terms of potentially improved fire safety, and cost efficiency. Are we really focussed on improving life safety, or is it all about economics? APF

**Mike Willson** is a firefighting foam specialist at Willson Consulting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# Training's not a game

Operations and training are so completely intertwined that a fire and rescue service can really be certain of having an effective operational response, only if its training and validation systems mirror it completely.

We have thankfully seen an underlying trend over the past decade in many countries of an overall reduction not only in the number of structural and landscape fires attended by emergency services personnel, but also in the actual number of people killed or injured in these incidents.

This is positive news of course, but there is another side to these statistics that is having an unintended effect on our emergency services personnel. Because there are fewer fires and incidents in general, incident controllers are becoming less and less exposed to having to manage incidents on a regular basis. If they are not getting this command experience, particularly at larger incidents, their practical skills base will naturally decline over time.

Against this background of a reduction in traditional fire service activities, the role of the learning and development department is becoming increasingly important. Of course, the purpose of training incident controllers is to give them not just the right skills, but also the relevant generic experience to allow them to deal with whatever they may face on the incident ground. If you follow the maxim: 'Train as you command; Command as you train', the result will be better decision-making when it really counts.

## Training Simulators Offer Cost-Effective Alternative

One option to fill this experience gap is to provide additional training to incident controllers on the practice ground, but this is obviously an extremely expensive option as you have to set up a new incident for each and every training session and tie up numerous officers to run and oversee the training. To provide exercise realism – essential to validate incident controllers properly – you will need to bring in the services of several other officers both from your own organisation and from other agencies to role play additional characters in the exercise. This includes police officers, paramedics, relatives, neighbours and even various members of the public, depending on the type of incident being created.

Using external role players will add significant costs to the exercise, which can be easily overlooked, but which must be included in any cost/benefit analysis, when valuing the cost of a simulator compared with other training options.

The more cost-effective, and more practical, option taken by the vast majority of services is therefore to use a fire simulation system. With the appropriate training, they are fairly simple to use, very much more cost effective, and the exercises can be easily repeated to ensure consistency of training and validation.

**There are fewer fires and incidents and incident controllers are becoming less exposed to managing incidents on a regular basis. If they are not getting this command experience their practical skills base will naturally decline over time.**

Objectivity, consistency and exercise realism are the keywords.

There are two distinct types of simulator a service should consider when reviewing its capabilities or needs in this area, depending on the level of training being undertaken. For level 1 and some level 2 incident command training, the best solution is a 3D simulator that utilises artificial intelligence (AI) to drive the system 'under the bonnet'. The student (incident controller) looks at a 3D view of a incident on a (preferably) large screen and makes his or her command decisions based on what he sees and also on any information he is able to gather from the video characters (role players).

The trainer, or facilitator, responds to these command decisions and implements them in the system. The controller can then see the exercise develop in front of him and is able to react accordingly. He is also able to review his decisions after the exercise has ended, as they are recorded on a dynamic timeline. This can of course help identify any training needs that may become apparent during the exercise.

In addition to the objectivity and consistency of training this delivers, the benefit of the AI is that it greatly simplifies the work that the facilitator has to do during an exercise, which in turn can help to reduce the manpower cost to the service. Pre-recorded video characters are used to replace 'real-life' role players, bringing training costs down significantly.

Services can of course also create their own videos and add them to the system, meaning that you can video your own officers and agency colleagues, further increasing immersion for the students. If the videos are filmed in front of a green screen and then uploaded into the simulator, the character will actually appear in front of the 3D view of the scenario. By doing this just once – and using them repeatedly – you are able to negate the need for multiple role players each and every time you want to run a training exercise.

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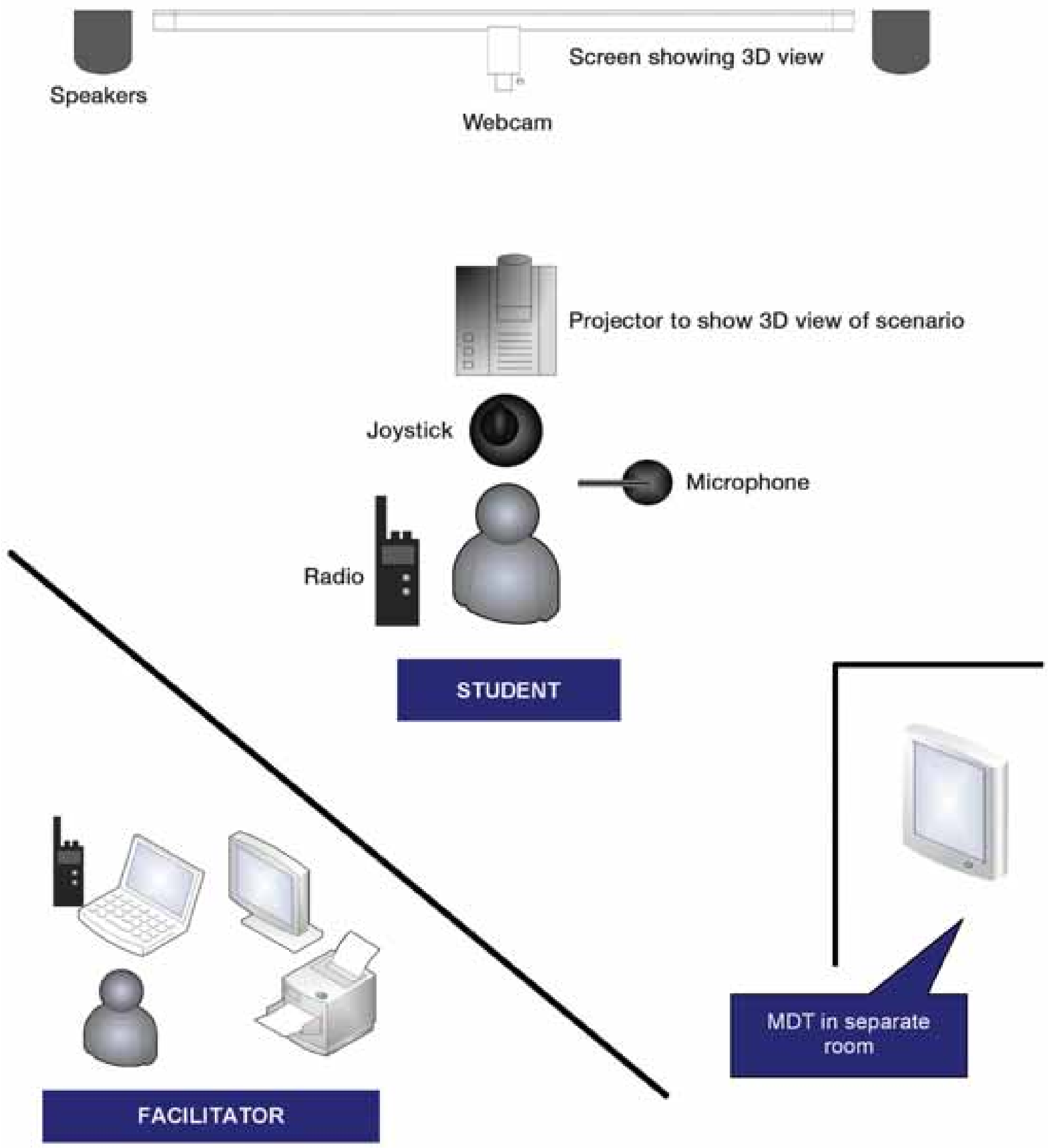
*Recommended room setup for using a fire simulator for command training*



## System Portability Provides Essential Options

Some training simulators of course require a significant investment in a fixed training suite and need several assessors and role players to achieve that level of realism and immersion. It can take several man-days to create a new scenario and although the scenario can easily be re-run, in practice it cannot be as easily repeated due to the extra personnel needed for the exercise delivery each and every time.

Portability of a simulator system is essential to give your service the maximum amount of flexibility. One regional UK fire service recently reviewed its learning & development delivery programme and calculated that it will save Aud $2.12 million over the cycle of its command validation programme. These savings will also be achieved by taking advantage of the inherent mobility and portability of the simulator system it utilises.

By reducing the number of officers that have to come to a central training suite (time off station, travel and accommodation) and by taking the simulator laptop out to the stations, the service could reduce costs and carry out more training with fewer resources and in shorter timescales. Future simulator system enhancements being developed, including distance delivery over the Internet, will increase these savings even further.

The New Zealand fire and rescue service has been innovative in the way it has chosen to train its controllers, impacted in many ways by its geography. It has invested in three command buses, which travel around its stations ensuring both the quality and consistency of training delivered and minimising time away from stations for the officers. They are in constant use throughout the year visiting the service's eight regions, delivering command training to over 2,500 officers.

## Ability to Change Scenario Types Quickly

The tactical command trainer system, which was first introduced in 1998, is now used around the world by fire and rescue services for their level 1 incident command training, including almost all of the Australian and New Zealand fire and rescue services and around 60 percent of services in the UK.

Re-developed from the ground up in 2010 with a new user interface and games-quality graphics, it is now possible to change a chosen scenario

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dramatically and very quickly. At the simple click of a button, you can completely change the look and feel of the scenario by selecting from a variety of different building skins, the size and location of the seat of fire or other hazard, the number and position of any casualties and of course the time of day and wind strength and direction. This gives the command trainer, or facilitator, a huge variety of exercise options, ensuring that students are faced with a very different set of risks every time they are trained or validated. Realistic building degradation as the fire develops contributes to the immersion.

Adding this to all the other variables, in one session a student might face a rural building fire with two casualties reported and in the next session face a suspected urban drugs house with a car fire in the garage, cylinder in the house and an adult casualty. And the 'no fire' option can be used for a hazmat or chemical suicide incident.

### Level 2 and 3 incidents

For more complicated incidents (level 2 and level 3), services in Australia and New Zealand rely on a training and exercising system, which is an advanced but easy to use exercise authoring and delivery system that supports tabletop and command post exercising of individuals (for example principle officers), incident management teams (IMTs) or entire response structures in a single agency, multi-agency or multi-national environment.

**The majority of services today use a fire simulation system. With training, they are simple to use, more cost effective, and exercises can be repeated to ensure consistency of training and validation.**

Utilising user-generated or off-the-shelf scenarios, the software fires media injects automatically into an exercise against a coherent timeline to provide effective, repeatable and affordable delivery and evaluation of realistic and robust exercise and crisis simulations. It can be used to stimulate incident controllers and command teams in a wide range of incident types by means of emails, text messages, news broadcasts, web pages, social media, faxes and scripts for telephone or radio calls. The system has both single and multi-site capability and requires only minimal staff for delivery of even the most complicated of exercises.

The prime scenarios created in this training and exercising system for Australian and New Zealand fire and rescue services include, arguably, some of the most challenging ones an IMT is likely to face – severe weather, tunnel, rail hazmat and wildfire.

### Training Facilities & Room Layout

In an incident command training suite, there is a recommended room layout that many services use to get the best out of their simulation system. In an ideal world, the facilitator should sit in a separate room, so that the incident controller is not distracted during the exercise.

Some services use a pre-recorded video from inside an appliance on its way to a building, which looks similar to the one in the simulator; this helps to make the exercise feel as realistic as possible and to get the controller thinking about what he may face at the incident ground.

The controller stands facing a large screen, which shows the 3D view of the incident, and is able to move around the scene (360 degrees) to carry out his analytical and dynamic risk assessments. To communicate his command decisions to the facilitator, he uses a two-way radio, just as he would on the fire ground. The facilitator then implements these commands by entering the relevant information into the simulator. He can also play the various video characters to help the controller with his information gathering – it is also possible to use a still image and for the facilitator to role play the voice of the character in certain situations.

### What Does the Future Hold for Command Training?

Operating alongside the existing artificial intelligence driven 3D simulator will be the ability to embed your own CGI videos of local site-specific risks and to change both the location and/or the size of the fire, with the resultant effects shown in the building degradation.

Continuously looped videos and simulated 3D graphics will be shown on multiple screens to simulate the sectorisation of an incident. Adding your own pictures and videos (including those built in other graphics engines) will further increase the training and validation options.

The focus on visual and audio cues for training of level 1 incidents will remain for the foreseeable future, but systems supplying information-rich data to those controlling level 2 and level 3 incidents have recently been developed – at the scene on a mobile control unit, from the operations room or from the strategic coordination centre. Fundamentally reflecting the information sources they would be exposed to at a real incident.

Combining a mobilising emulator with the training simulator and command support software will make this possible by feeding into the exercise 'real time' main scheme messages and resource information as if from control. A simulated camera view is visible in the imagery manager module of the command support system and for added realism videos, images and documents can also be imported to simulate varied scenarios and incidents.

Innovative services are increasingly putting their mobile control unit downtime to very good use, by using their expensive, but well-equipped resources as mobile training vehicles. Not only can a mobile control unit be used to train crews, watches and commanders, but also loggists and other essential command support staff in a realistic environment. And of course because they are mobile, the training can be taken to where it is needed, rather than incurring the expense of always bringing the students to a central training suite. This flexibility is proving very attractive to services, all of which need to maximise the cost effectiveness of all their assets.

Incident command training is most certainly not a game. It is about having a single, end-to-end command training, validation and qualification solution that gives your personnel the training, input and skills to make the right decisions at the time it counts. APF

**Neil Bibby** is Managing Director of VectorCommand Pty Ltd

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Sampling manifold with five detector tubes

# Detecting Unknown Chemical Hazards

**Wolfgang J. May**

PT DraegerIndo Jaya

In many cases, first responders have to deal with unknown chemicals, which can be either toxic industrial chemicals (TICs), or chemical warfare agents (CWA). Under all circumstances there is only limited time to determine which chemicals are present, otherwise even more important actions would be neglected. The necessary equipment should not be too complicated in use or too bulky.

Based on practical experience in the field, a combination of direct-reading detector tubes and portable electronic instruments has proven to be suitable to allow fast and reliable detection and measurement of both toxic industrial chemicals and chemical warfare agents. User-friendly evaluation charts will guide the user to properly evaluate the different colour stains in the detector tubes. Comprehensive information in the display of a portable instrument gives a clear picture about the kind of chemicals being present and their concentrations in conjunction with audible and visual alarms in case certain levels have been passed.

## Strategic Approach

In general industry we find about 5,000 to 6,000 different chemicals that are in daily use; some in small quantities, some in larger quantities. In the case of a chemical accident, whether this is a spill, an explosion or a fire, we should be prepared to determine within 15 to 20 minutes which chemicals are present. There is no single instrument available that could detect all 5,000 chemicals in one unit. Because of the large variety of different chemical behaviours, we need a strategic approach. Nobody is willing to carry a whole bunch of detection equipment in the field to be prepared for everything. Despite budgetary questions, there will always be an issue of having very limited time.

There are three essentials to follow:

**a** The better our knowledge of the present chemicals, the better and easier we can be prepared to select the proper detection equipment and, of course, also the protection equipment.

**b** If we do not know what is present in the case of unknown chemicals or warfare agents, we need a strategic selection of detectors based on the statistical evaluation of chemical accidents. This limits the number of necessary equipment drastically.

**c** Besides the selection of instruments, we

*Explosimeter for the detection of combustibles*

need regular trainings. This way, each and every individual first responder feels comfortable with his or her equipment and knows very well how to use it and how to evaluate the results in a limited period of time in the field.

### The Tubes Approach

Direct-reading detector tubes have the big advantage of allowing the measurement of a large variety of different chemicals. A length-of-stain type discolouration of the reactive chemicals inside the tubes is a measure of the concentration. Based on printed-on scale marks or a full scale in parts per million (ppm) the concentration can be evaluated directly in the field. No calibration is required by the user. Ambient air is drawn through an opened tube by means of a manually operated bellows pump; no battery is necessary. The tubes can be used at any time without preparation by the user.

In order to save valuable time in the field for first responders, there are detector tubes available consisting of five tubes per manifold. They can be used at the same time. Thus, the measurement time is reduced by the factor of five. So, we observe five results in the measurement time of one.

There are three different simultaneous test kits available; they are utilised to measure the following toxic industrial chemicals. The tubes inside the kits have been selected based on the statistical evaluation of accidents where individual chemicals could be identified.

### Kit 1:

**1** Acid Gases (Hydrochloric Acid, Nitric Acid, etc.).
**2** Hydrocyanic Acid.
**3** Carbon Monoxide.
**4** Basic Gases (Ammonia, Butyl amine, etc.).
Nitrous Gases (NO + NO$_2$)

### Kit 2:

**1** Sulfur Dioxide.
**2** Chlorine.
**3** Hydrogen Sulfide.
**4** Carbon Dioxide.
**5** Phosgene

### Kit 3:

**1** Ketones (Acetone, Methyl Ethyl Ketone, etc.).
**2** Aromatics (Benzene, Toluene, etc.).
**3** Alcohols (Methanol, Ethanol, etc.).
**4** Aliphatic Hydrocarbons (Hexane, Octane, etc.).
**5** Chlorinated Hydrocarbons (Perchloroethylen, Trichloroethylen, etc.).

As we can see with the above mentioned three simultaneous test kits we can measure TIC's toxic industrial chemicals. They are either used as bulk chemicals for example, hydrochloric acid and vinyl chloride, which are released during spills such as hydrocarbons, or those that are formed as decomposition products during fires, as in the case of hydrocyanic acid from plexiglass, hydrochloric acid from polyvinylchloride, and phosgene from chlorinated hydrocarbons. In case we detect the group of chemicals similar to the representative chemicals in kit 3, the tubes are typically calibrated with the most toxic chemicals.

With the combination of these three simultaneous test kits plus one electronic portable instrument to measure combustibles, first responders are prepared to detect 85 percent of unknown chemicals in the field.

We strongly recommend using a continuous monitor to detect explosives or flammables as they are very common. In addition, while utilising a multi-gas instrument, the rescue team would also have the ability to monitor for oxygen deficiency and carbon monoxide, which can be particularly importance, particularly inside buildings or confined spaces.

But, what about the remaining 15 percent?

*Sampling manifolds with tubes for chemical warfare agents in the transportation case*

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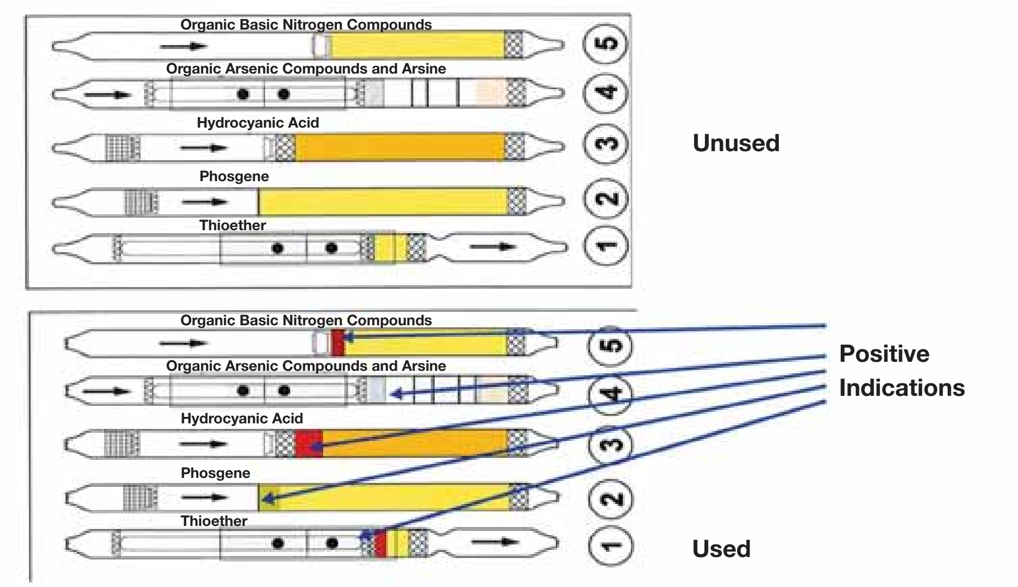
*Instruction cards for the sampling manifolds*


Organic Basic Nitrogen Compounds
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Organic Arsenic Compounds and Arsine
Hydrocyanic Acid
Phosgene
Thioether
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Positive Indications
Used

Well, the one particular group of chemicals being left out so far is CWAs. Typically when talking about chemical warfare agents, we talk about the following substances:

- **Nerve Agents:** Sarin, Tabun, Soman, VX.
- **Blister Agents:** Mustard Gas, Lewisite.
- **Blood Agents:** Hydrogen Cyanide, Cyanogen Chloride.
- **Lung Agents:** Phosgene, Chlorine.

For the fast detection of CWA' there are other kind of sampling manifolds available with five tubes each. Similar to the simultaneous test kits for TICs, each sampling manifold comprises five different direct-reading detector tubes. With two kits, we cover all groups of CWAs. As a convenience for the user, the tubes are available in rugged transportation cases which can be taken anywhere in the field.

The case also contains evaluation charts to determine the concentration of individual warfare agents conveniently.

The sampling manifolds allow for a fast detection of CWAs using the same bellows pump as mentioned for the simultaneous test kits. No calibration or charging of batteries is required.

## Detection of Fire Accelerants

Not all fires happen by accident, some of them are man-made utilising fire accelerants such as petrol. After ignition with they create large flames and a huge fire, particularly inside buildings. To evaluate the reason for a fire after it is finally extinguished, it is often helpful to use a very sensitive instrument. This way, it is possible to detect low concentrations of volatile hydrocarbons that may have been used as a fire accelerant by means of a photoionization detector. The working principle of a photoionization detector is the forming of ions by means of UV-radiation inside this instrument. These ions form an electric current that is detected within the instrument. The strength of this current is a measure of the concentration of a volatile organic compound ( VOC).

Due to their working principle, photo ionization detectors (PID) cannot be substance specific. If there is an investigation in a building after a fire, the rooms may be screened as a final step with a PID. It helps find locations of where fire accelerants have been used to intentionally ignite the fire. As a subsequent analysis, we could draw an air sample with an activated charcoal tube for subsequent laboratory analysis to determine qualitatively and quantitatively of the composition of the fire accelerators.

## Conclusion

The combination of direct-reading detector tubes and portable electronic instruments allows for fast detection of unknown chemicals, TICs as well as CWAs. This makes it a vital equipment for first responders. Third-party validations have proven sensitivities, response times, and specificities as well as the practicability in the field with limited training required. The photo ionization detector is a major step forward to determine small concentrations of fire accelerators inside a building. APF

*Photo ionization detector*

**Wolfgang J. May** is Asia Pacific Regional Marketing & Application Manager at PT DraegerIndo Jaya

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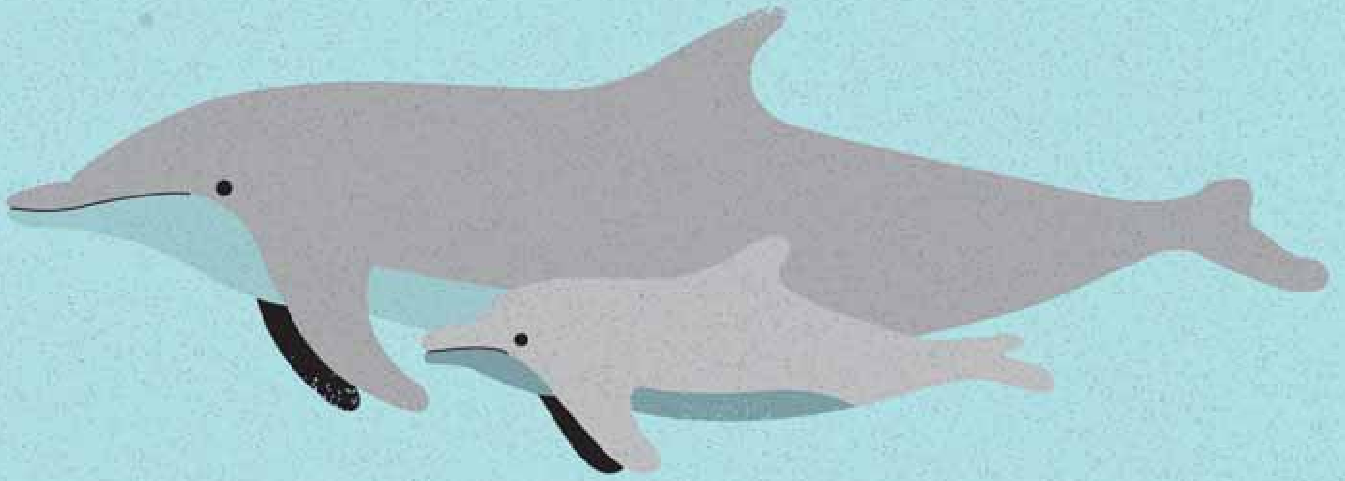

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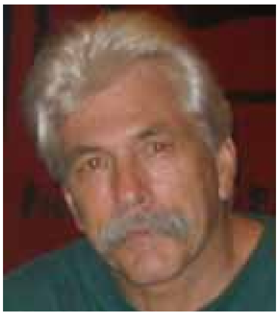
# ASD in Industrial and Harsh Environments: Part Two



**Paul Leslie**

Xtralis

In the previous edition of Asia Pacific Fire we discussed the industrial market sector and looked at fire detection equipment selection for harsh environments. This article now looks at the actual approach that should be considered when installing fire detection in these environments and particularly when selecting Aspirating Smoke Detection (ASD).

## The Site Survey

Invariable the approach taken by those who design or install detection systems in industrial applications tends to be much the same as that taken when dealing with cleaner environments. Minimal thought is given to the actual site application; there is a limited understanding about the facility, the processes that may take place or the environmental conditions, inevitably leading to an undesirably installed system.

A thorough site survey of the facility is fundamental to ensuring the correct system design and one of the key critical steps that should be undertaken when planning an ASD system. Of course this is not always possible, particularly when the project has not yet been constructed, however where this can be undertaken it is strongly recommend that a site visit be made. Further and to gain the best understanding of the site and conditions, get the client thoroughly involved.

Client participation provides advantages in that many things are revealed about the site that may not be evident when simply doing a walk around or designing from drawings. An ASD system design should begin with beneficial knowledge where client participation is included.

Here are some points to consider when conducting a site survey. Familiarise yourself with the entire site and operation, including:

- Building/Application construction and neighbouring businesses.
- Production/processes and activities undertaken.
- Working operations/changes throughout a given year.
- What takes place, how, when and where.

- What and where are the fire hazards/risks areas of concern.
- Consider the building height and access to detection.
- Note ventilation whether natural or forced.

Get to know the environment:

- Air flow movement/speed.
- Contamination situation – Dust/smoke/other airborne pollution – chemical contaminants, etc.
- Summer/winter temperatures/stratification/humidity/moisture.

Client involvement:

- Ask questions – Ensure the end user understands what can be offered – the benefits and limitations of the proposed system.
- Draft a brief letter/report of your findings and intentions.
- Set down details if need be so that all parties are clear as to what the system can and can't do.

## Smoke Testing & Design Considerations

Uncommon as it is, smoke testing is the best way to determine the way in which air behaves in a given environment and should be conducted only with the approval of the client. If possible have the client present. A greater understanding of the site conditions is possible with smoke testing and early detection effectiveness can hinge on where detection (ASD sampling points) is located.

Since each application is individual, each will also have different conditions; building size, shape, roof height, machinery, equipment, processes and so on, all of which will impact on the way air moves. Is air movement always consistent, what happens when doors or shutters are closed, does the pattern change if these are left open? The pipe system layout must be harmonious with the air movement, after all this is what ASD is all about.

Many applications will be relatively straight forward, others more difficult and some will even require special engineering techniques to operate in conjunction with the ASD system. Regardless of the type of application, environment, size and shape, to ascertain the correct location of the ASD sample pipe and sampling holes smoke testing should be conducted.

It may be that some applications will require a "performance based" approach, not necessarily one where there is a need to engage specialist fire consultants to engineer the design, but more simply a practical or common sense view to the application whereby it may be advantageous to undertake smoke testing and trial a system to evaluate its effectiveness. Fire detection systems are not always a mandatory requirement in industrial applications.

Certainly there will be those specified applications where fire consultants have been engaged and instances where meeting prescriptive requirements could be a hurdle if effective detection is to be met. In these situations the appropriate authorities as necessary may need to be consulted if a prescriptive requirement can adversely impact on the detection capability. While fire system design in the main must comply with the requirements of codes and standards prescriptive layouts are not always practical or the best way in which to detect fires in certain industrial applications

Smoke emitters are typically the best way to conduct testing. They provide a good indication of air movement but must also be done in several locations to gain the best appreciation of air movement. Regin or Ventax smoke emitters are available in different sizes from air conditioning companies and are ideal for this purpose. Coloured smoke emitters are sometimes used to demonstrate to the client the effect of smoke dilution.

## Sampling Pipe Installation Considerations

While the installation of sampling pipe is important in any ASD application, it is perhaps even more so when installing in hostile environments. The sampling pipe network may also seem somewhat insignificant to some, and is, from time to time subcontracted to inexperience installers who treat it as just another "conduit run".

An ASD pipe network is the foundation of the system and a good layout is critical to the overall performance. Sampling holes in industrial ASD system designs are typically larger than those used in cleaner environments, generally around 3 mm or larger and performance must be carefully modelled using appropriate software. It is also recommended that holes be "countersunk". Countersinking of holes minimises contamination build up at and around the hole and assists by creating a mini "venturi" effect, allowing contaminates to be easily drawn back to the detector where they are dealt with through efficient filtration.

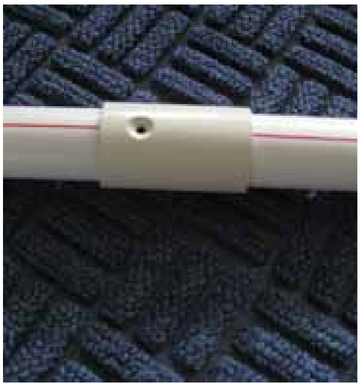
## Air Flow

Air flow is the very essence by which this technology functions, so why is it that many tend to forget this basic concept?

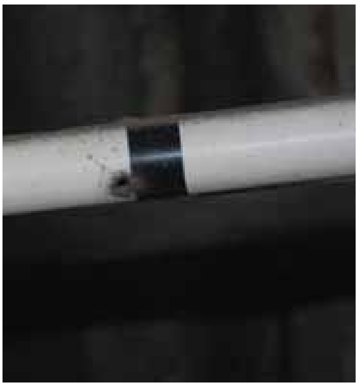
We must get this part of the system correct and working in partnership with the detector, otherwise we can forget the whole deal – the system will not perform satisfactorily. No matter what type of detector, controls or type of flow sensing is employed within a detector, implementing a few simple measures can result in a more stable system. A well-designed pipe network can also assist in fault finding any air flow faults that may be associated with environmental disturbances, those not necessarily a result of the system design.

The smoother the air flow can move within the pipe, and with minimal interruption and friction, the better the whole system will function. Sampling pipe leading directly into the detector ports for example should be straight and without out interruption, that is, at least 500 mm of free pipe should be installed between the detector and before any bends or pre-filtration or any other in-line components are added.

This consideration rules out any possible flow turbulence issues that maybe created when air is immediately being drawn into the detector.



*Typical countersunk hole*



*Hole without countersinking*

*Dirty, but not blocked*

Some other simple measures include:

- Ensuring all installed pipe runs are straight without sagging and fixed securely at appropriate intervals. If this means closer spaced fixings than that required by local codes or standards require, then so be it.
- Consider expansion & contraction joints – Sampling pipe at roof level in metal buildings will inevitable be influenced by building movement.
- Always install long radius 'sweeping bends' to assist flow and minimise contamination build up at bends – "T" joints and elbows while suitable in clean applications are not recommended in industrial environments.
- Minimise pipe joins and ensure the correct glue is applied for the type of pipe used . . . and make sure it is applied sparingly.
- Consider 'catenary' cable where access may be difficult or where obstructions create the need for more bends. Sampling pipe affixed to catenary cable allows straight and true installation of pipe.
- Consider hole orientation.

## ASD System Engineering

There are many ways in which to approach, adapt or enhance the performance of ASD in industrial facilities to ensure the best possible operation and performance. Many system installations are straightforward; others, due to their location, operation and the site conditions require some level of system engineering, that is, the use of additional measures to perform reliably within the environment.

This task is made considerably easier if the detection equipment is purpose built such as that offered by Xtralis. The (VLI) "Industrial" detector was specifically designed and developed for use in hash and difficult environments.

My experience over the years has shown that when designing ASD systems for the industrial market sector, one must also be conscious of the possible and various pitfalls, often unclear to those with little ASD installation experience or those that have only applied ASD in cleaner environments.

Temperature variations and humidity can create unforeseen issues. Sometimes a detector can be located only in the area in which it is to detect and where high and low temperature conditions exist. Applications where hot, cold, humid or wet conditions exist may require some system engineering. Similarly protecting the pipe network from extremes of temperature may mean installing specific types of pipe. Metal can be used, in fact copper, stainless steel, HFT and other similar pipe is acceptable and has been successfully used.

Protective enclosures may also be required for equipment to guard against tampering; process washes downs, steam or any other on site environmental condition. Detectors may require cooling in some instances, which can be accomplished through simple thermoelectric cooling, air can also be cooled using other techniques. Perhaps specific chemical pre-filters may be needed to assist in minimising the impact of background air contamination before it enters the detector, this can be done thus protecting the internal detector components from corrosion. Whatever the conditions, ASD in most situations can be adapted and various methods of system engineering applied.

## Detector Contamination

It is no secret that aspirating smoke detection was conceived and developed for use in "clean" environments, that is, telecommunications, data centre and computer room type applications.

Switch rooms, control centres and the like are also typical applications where ASD is the chosen product and where very early warning is accepted as the best technology. However let us not forget that it has also proven itself time and time again in hostile environments, and although there are still perceived views within the fire industry that ASD is unsuitable, thousands of systems have been installed globally for over 25 years.

The one very important fact associated with any detection equipment used in industrial environments is that, it will suffer the effects of wear and tear and particularly contamination impact. Regardless of the technology, whether photo-optical, point, ionisation or laser, equipment deterioration, is inevitable . . . even with ASD systems.

Since ASD systems actively draw in air, together with whatever contamination there may be in the environment, management of contamination is essential. Minimising the impact on the equipment requires good physical filtration. Unless this is addressed correctly contamination will ultimately compromise performance and the serviceable life of the equipment. An ASD system proposed for use in hostile environments must be equipped with the best filtration measures possible if it is to survive.

With the increase in ASD products globally each manufacturer has developed varying ways in which to deal with contamination. Some detectors draw in 100 percent of the environment air without filtration relying on complex algorithms and other measures to manage dust contamination, at

*Warehouse environment with heavy build-up of dust on boxes*

the same time suggesting smoke can be detected effectively. Others use minimal or basic mechanical filtration methods and only apply pre-filters in applications that really warrant.

Suffice to say that any aspirating smoke detector not designed for the environment will draw in contaminated air and without the proper filtration will experience the effects.

Pre-filters have become a part of ASD systems used in many hostile environments. However, there is one important aspect that must be made clear and an issue unknown to many who install and maintain ASD system in these difficult applications – pre-filters are not monitored.

When pre-filters begin to accumulate a certain level of contamination they will not allow smoke to be drawn to the detector. This phenomenon is termed "smoke attenuation". The pre-filters can become contaminated to such an extent that only air will pass through. It is difficult to say how long this phenomenon will continue before an actual air flow fault is raised since all ASD systems are different. It will also depend upon the type of contamination within the environment. A time frame anywhere from a week to perhaps months is not unusual. The issue arises when the maintenance regime applicable to the pre filters is not strictly followed. The required level and frequency of maintenance depends upon the application and the environmental conditions but the underlying concern is that a period of time can pass where the ASD system will not effectively detect smoke.

Xtralis has recognised this problem and developed for the industrial market a specific detector that incorporates a monitored "Intelligent" filter within a purpose-built detector designed with contamination in mind.

## ASD System Maintenance

I have said that industrial applications comprise many different environments and conditions and as such the degree of preventive maintenance for each must be considered in line with the type of contamination and concentration level within the area. Environments with low levels of background contamination may require only preventive maintenance as set down by the manufacturer in its product manual. However, where contamination levels are more severe additional preventive maintenance will be required.

In addition to the detector and pipe network a certain level of attention must also be given to any other ancillary equipment associated with the system, for example:

- Chemical pre-filtration – Media must be checked and changed regularly.
- Water traps/coalescing filters/driers – These must be checked periodically to monitor either water build up or evaporation.
- Back flushing – A practice regularly implemented to clean the pipe network in hostile environments.

This equipment may either be manual or automatic and any components associated with this set up will need servicing.

Maintenance can be conducted by the original installer or an authorised distributor or well-trained service contractor. Some companies specialise in the maintenance and service only of fire systems becoming well versed in what is appropriate, what works and what does not.

In all, industrial sites will require a more rigid level of maintenance and service than cleaner applications.

## Are all ASD Systems Suitable for Industrial Environments?

This is a question that can be answered only after the proper evaluation of the various ASD products available to the market. We are all pretty much aware that equipment manufacturers push the worth of their products over that of their competitors and here, once again the user, specifier and fire contractor is faced with a choice, albeit now to do with the selection of an ASD system.

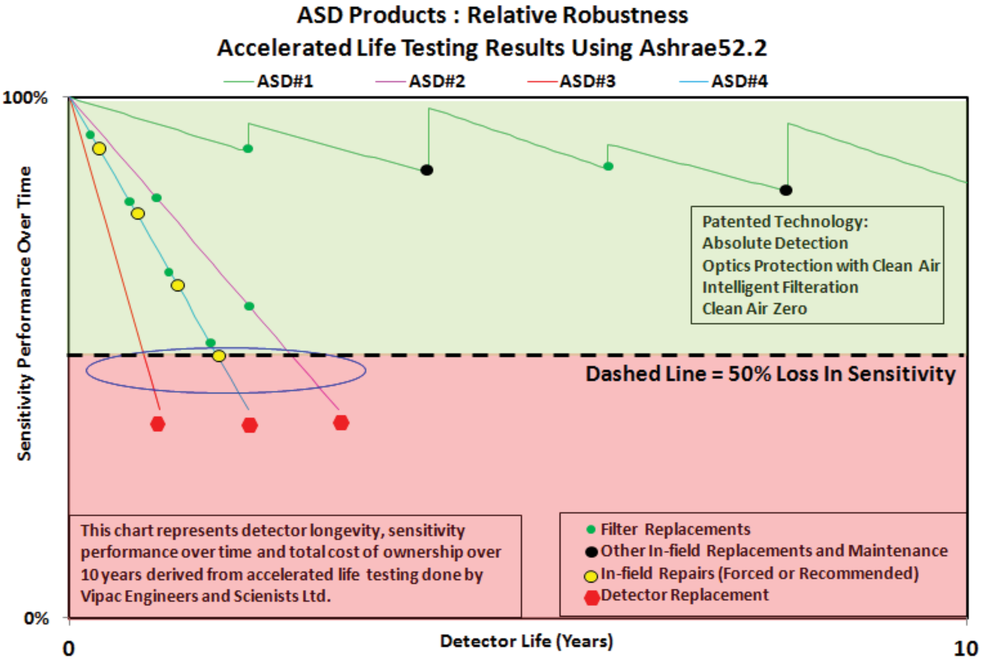
Having stated that any fire detection equipment used in hostile environments will suffer the effects of contamination it is important to recognise that even among ASD products all is not necessarily equal. Each manufacturer's equipment must be carefully analysed to ensure suitability for the application and conditions. Fortunately this evaluation process can be made simpler if consideration is given to "Independent" third part product testing.

Interestingly Hughes Associates, Inc. (Fire Science & Engineering) (HAI) in the USA conducted a webinar in July 2012, entitled "Testing & Verification of ASD Products in Different Environments". HAI witnessed and verified testing of several manufacturers ASD products.

Testing was undertaken to assess ASD performance under different environments as may relate to different applications. ASD technologies can have different detection principles and methodologies and as such can perform differently relative to the application and environment. Several product brands were tested with varying results. Not only were products tested for clean environments but also for industrial environments, the aim to better understand the features and options available in ASD technologies and their performances in these various applications and environments.

With regard to "industrial" application testing the focus was on determining the performance of ASD as a technology in these environments by evaluating:

- Detection performance in moderately high airflow environments.
- Test performance of ASD with automatic alarm threshold adjustment algorithms to slow smoke growth scenario.
- Test performance of ASD in moderately low ambient background smoke levels.
- Test ASD long-term performance to impact of contamination on hardware.



- Comparative assessment of detection response to smoke and dust sources.

In a further attempt to establish the suitability of ASD products in industrial or hostile environments Vipac engineers and scientists also conducted some testing of a number of current market available ASD products. The testing was very specific, relating to "accelerated life testing" using Ashrae 52.2 standardised loading conditions (dust).

Four commercially available ASD products were chosen and tested. The detectors selected were those where the respective manufacturers market their products as being "suitable" for use in industrial environments and conditions which could be considered harsh or hostile. Subsequent to the vipac testing, the following chart was developed to indicate the results. The outcome is surprising and certainly shows that not all detectors will offer the same performance when exposed to dust.

I might add that the chart has been modified slightly for this article and the four detectors tested have been indicated only as ASD #1, #2, #3 and #4.

Testing showed that detector #3 had a relatively short life cycle and could sustain operation only over a short period before replacement was required. Detector #4, while having a slightly longer life cycle, did require both frequent filter replacement and repairs. Repairs typically relate to aspirator and/or sensing chamber diminished performance or failure. Some component failures can be addressed in the field, others require return to the manufacturer. Detector #2 experienced better performance than #4 and #3 although its life cycle was also less than desirable. Only one detector, #1, showed that it could sustain a substantial life cycle at the same time deal with the effects of dust.

Perhaps the most critical aspect observed with this testing is that of deteriorating detector sensitivity. Three out of the four detectors showed significant sensitivity loss during testing. This is certainly a major concern when selecting equipment for these environments, after all this is about detecting fires early and effectively is it not?

So, what is the aim of all this? The overall aim and subsequent results of any independent third-party testing is to establish the suitability of fire detection equipment to do its job in the application and environment for which it is intended. Educating practitioners and others about the correct selection of any product including ASD and its true performance in industrial environments can lead only to better installed and performing systems with ultimately less likely problems and nuisance alarms.

## Summary

Air sampling smoke detection has come a long way since its inception. Today there are many global manufacturers with a host of products. The detector is only one part of an ASD system and managing performance in both clean and difficult/dirty environments with this technology requires knowledge and experience.

To provide the best possible fire protection for an industrial application/environment means selecting the correct technology and the most appropriate product in the first instance. It must be purpose built and be able to withstand the conditions on site providing efficient and effective contamination management. The detector must maintain its sensitivity over the life of the detector and provide a low total cost of ownership.

A practical and cost effective design that includes the pipe network is also a significant factor if the system is to offer performance with low maintenance for the expected life of the equipment. Most importantly, the system must be installed, commissioned and maintained correctly with follow-up checks to make the necessary adjustments that were either known or unexpected at the design stage. A good system, designed with adequate capacity will be able to be 'fine-tuned' post installation to ensure the expected performance for the end user.

Finally, ASD systems can perform in industrial applications and environments but should only be designed and installed by those with knowledge and experience. If you don't have the knowledge and experience, get it! **APF**

**Paul Leslie** is Special Practices Manager at Xtralis

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# What's New in PPV

With the greatly increased use of PPV, the leading manufacturers have boosted their research and development efforts to provide firefighters with the most efficient and reliable equipment. In this Buyers' Guide we highlight the latest offerings from the world's leading suppliers.

## Large Flow Fans

LEADER has two large flow ventilation units, the Easy 3000 and Easy 4000, designed to prevent flames and smoke spreading in large structures such as parking garages, airports, aircraft on the ground, subways and rail and road tunnels.

The large flow fans offer two engine types. The Easy 3000 uses the Rotax aircraft engine and the Easy 4000 has the BMW Flat Twin engine. The Easy 4000 fan gives a powerful airflow of 235,300 CFM in the open air and the four-stroke BMW engine has electronic start-up. The Easy 3000 offers airflow of 206,000 CFM in the open air from its two-stroke Rotax engine.

During what Leader describes as "exhaustive testing", smoke filling a 3000 cubic metre warehouse was cleared in just 30 seconds. During smoke extraction in a one kilometre double-track tunnel, the smoke was cleared in 12 minutes bringing sufficient visibility to enable firefighters to enter. The tunnel was completely cleared within 20 minutes.

Their extremely low weight means that just one or two firefighters can handle them easily. Equipped with a nozzle spraying system in their standard version, these large flow fans offer effective gas dilution, dissipation or displacement and smoke cooling. In addition to the light-weight trailer version, the two fans are available in a "skid" version that can be attached to any type of truck or trailer. Other options available include a 360° manual rotation system, 600mm or 1200mm elevating platforms, flexible exhaust gas extensions and blowing ducts.

**For more information, go to www.leadernorthamerica.com**

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## Firefighting ops revolutionised

One major problem of positive pressure ventilation (PPV) and positive pressure attack (PPA) operations is that traditional fans create a cone of air that begins to diffuse typically between 1.2 metres and 2.4 meters from the blades.

That means in order to be effective the fan must be located as close to the structure as possible, and that location is usually also the primary access point.

Unfortunately, even small traditional PPV fans obstruct access, slow operations, and blast noise into a structure, but setting it farther back reduces performance. This trade-off problem has plagued firefighters since the adoption of PPV.

Ramfan is a brand of EURAMCO SAFETY and it Ramfan X-Series PPV fans solve that problem with the PowerStream – a straight beam of air that doubles operational setback distance to at least 2.4 metres to 4.9 meters without sacrificing performance. Extended setback allows easy access, eliminates the need to keep repositioning the fan to accommodate traffic, and reduces motor noise inside a structure. This allows firefighters to get their jobs done faster so they can get home safely. Depending on the fan size, motor power and door shape, larger X-Series blowers can ventilate office buildings and warehouses from up to nine meters away.

Ramfan's PowerStream has revolutionised firefighting operations by allowing strategies and tactics unthinkable even a few years ago. PowerStream fans are also used in mine and tunnel ventilation, industrial maintenance, and aircraft wheel cooling. PowerStream is available only on Ramfan's X-Series: petrol-powered GX line, electric EX line, and trailer-mounted VX700.

**For more information, go to www.euramcosafety.com**

# Look & Learn

Positive pressure ventilation is a powerful firefighting tactic when used correctly. With the HAAGEN Positive Pressure Ventilation (PPV) Trainer, it is now possible to conduct hands-on PPV training that is efficient and effective. The PPV Trainer allows you to challenge trainees to control doors, windows and roof vents on a number of floor plans to successfully ventilate a building.

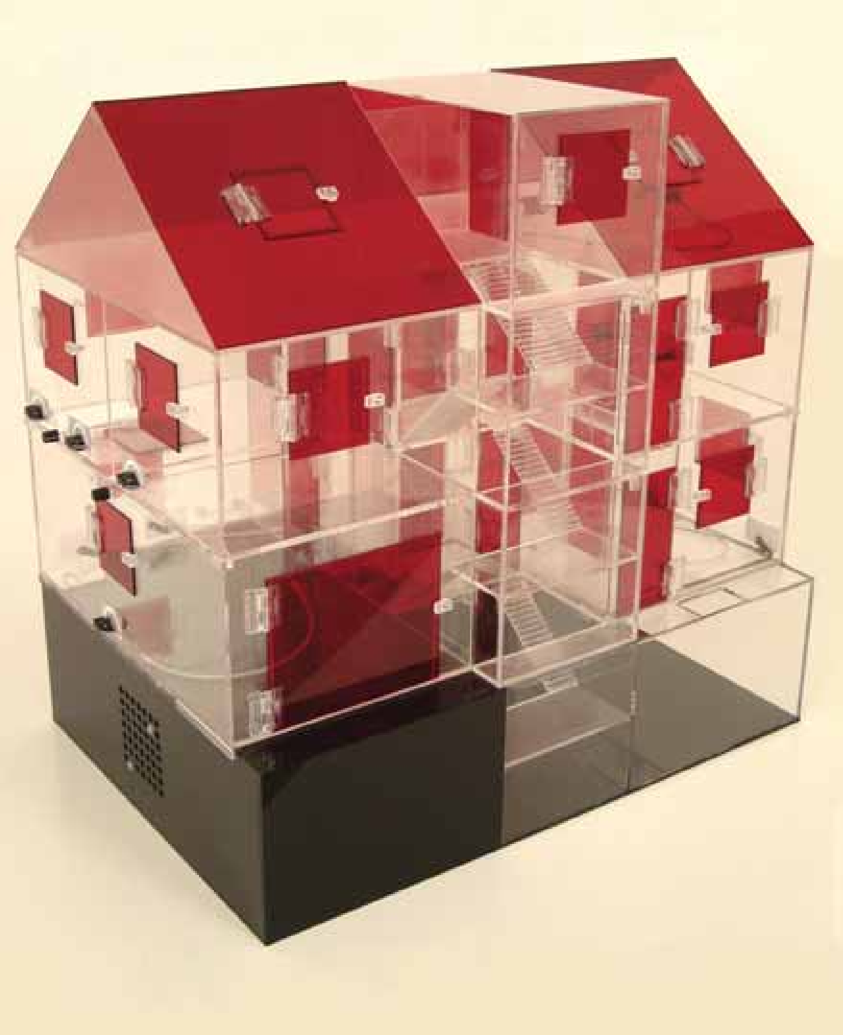
Students can set-up fans, introduce smoke and control doors, windows and ventilation holes to learn the principles of PPV. Clear walls and red transparent doors allow students to visualise the air flow and learn to control ventilation. The PPV trainer is a modular system enabling a range of training opportunities.

- The PPV simulator comes standard with a basement, first floor and roof for basic residential fire training.
- Add additional levels and choose from a number of floor plans for more advanced fire scenarios.
- The internal smoke generator with on-board smoke fluid reservoir is located in the basement of the structure. Smoke channels built into each level are used to fill the entire structure or specific rooms with smoke.
- The handheld controller can be used to operate the on-board smoke generator and fans.
- All windows and doors are fully operational and ventilation holes are included in the roof.
- Internal doors are operated with cables and knobs mounted to the exterior of the floor.
- Choose from a number of floor layouts and create a customised model based on your training requirements.

Training opportunities include:

- Challenge trainees to use positive pressure ventilation to quickly clear a smoke-filled structure.
- Show trainees how to open and close windows, doors and vents for optimal results.
- Educate on proper fan positioning and the use of multiple fans for large openings.
- Demonstrate the advantages and limitations of both negative and positive pressure ventilation.
- Simulate strong wind conditions and challenge trainees to maintain control of building ventilation.
- Combine the PPV Trainer with the HAAGEN Desktop Flashover to demonstrate the dangers of flashover and backdraft when ventilating.

**For more information, go to www.haagen.eu**



# Explosion-proof Offering

RUWU has four versions of its portable VM Series PPV fans – the VM 400 D ex; the VM 600 D ex; the E VM 400; and the VM 600 D.

They feature maintenance-free electric drive and full explosion protection for Zone 1 and Zone 2 environments. The support frame can be placed directly on an open manhole, so no diffuser or adapter is necessary, and the frame has built-in adjustment that allows the inclination of the casing to be changed to suit the application.

**For more information, go to www.ruwu.de**

# Super Performer

The SUPER VAC VR3 is a variable speed, electric, positive pressure fan evolved from the popular VR2 model. The VR3 is the only variable speed fan in the industry that will run on any 15 amp GFCI circuit and all new hydraulic generators without compatibility issues. It also offers precise control of air movement and up to 33 percent more airflow than single speed electric PPVs.

The heart of the VR3 is the famous Super Vac seven-point blade that creates a powerful cone of airflow. The cast aluminium aerofoil blade holds up better than plastic in the high radiant heat of structure fires. The VR3 maintains Super Vac's commitment to safety with its full roll cage frame that offers protection for the shroud and motor. The shroud can be tilted into four different positions from-10° to 20°. The frame features a powder coated finish that is made to last.

Transportation is easy with inboard mounted solid cushion tires that enable the user to go up and down stairs and manoeuvre corners with its "zero catch point" design. A step brake locks both wheels into position for a solid base while in use or in storage. A fold down handle makes the unit fit easily into smaller truck compartments.

The Super Vac VR3 is available in four sizes from 406mm blades for departments with smaller residential buildings, up to 610mm blades for departments with a significant number of commercial sized buildings. With a full line of accessories, the VR3 is the most impressive variable speed positive pressure ventilation fan on the market.

**For more information, go to www.supervac.com**

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TEMPEST™ TECHNOLOGY

# New PPV/PPA Duo

Building on its extensive history in positive pressure ventilation and attack, TEMPEST TECHNOLOGY recently announced the latest addition to its PPV/PPA arsenal, the Special Operations Power Blower, or SP Blower.

This new ventilation blower is said to feature a number a new design traits, most notably its reinvented tapered shroud and flattened grille veins. These two new characteristics create a Laminar Air Flow (LAF) that allows for more effective and aggressive ventilation in unique types of structure.

Laminar Air Flow mimics the same principle as is originally applied to water flow – multiple layers flowing parallel to each other, creating a narrow high pressure air pattern – making its high pressure properties to be more effective in ventilating unique structures such as high-rise buildings, stairwells, complex structures and commercial structures over 465 square metres.

The SP blower is currently offered in two sizes: a 460mm with a 5.5 hp engine and a 535mm with an engine just under 9 hp. Both sizes are designed with wheels in the back, a wider footprint for increased stability and allow for increased set back due to its Laminar Air Flow air pattern. Electric powered models are already in development by Tempest as well.

Also recently unveiled by Tempest is a rapid deployment barrier called PathMaster, which allows firefighters to quickly and effectively control and manipulate interior flow paths. In addition to flow path and smoke spread/damage control, the PathMaster is designed to aid firefighters in more aggressive positive pressure ventilation. With the tool's ability to reduce doorway size, PPV fans may be placed closer to the vent point while still being able to effectively seal the doorway, delivering increased air volume and pressure. Placed in its storage bag and with a depth of just less than 38mm, the deployable barrier is capable of being carried on a rig without sacrificing excessive compartment space.

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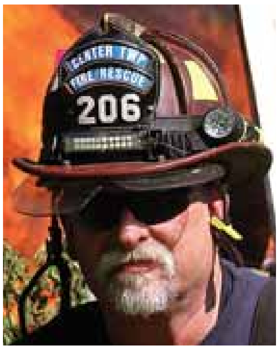
# Choosing the Right Firefighting Nozzle



**Rod Carringer**

Task Force Tips

With hundreds of models of handheld firefighting nozzles from which to choose, the choice can be confusing and the decision making process often frustrating.

Before investigating which nozzle may be an ideal choice for initial attack fire flow operations, one basic factor must be considered before all others: Determining the agency's target fire flow will be critical to the overall success of the nozzle choice. To assist in this determination, several questions about departmental operations need to be answered. How many litres a minute are required to absorb the heat being generated by the fire during initial attack? What are the most predicable fires, their contents, and size (based upon department historical experience and what flows have been successful in the past)? What is the experience level of the firefighters expected to participate in initial attack operations?

Ideally, after some review, and taking accepted fire flow formulas into account, a target fire flow will be determined. This minimum flow to be provided to the nozzle team will be used to determine pump discharge pressure after taking into consideration hose size, length, and nozzle operating pressure. Once the determination of pressures, losses, and minimum flows are taken into account, operational guidelines can be established to consistently and repeatably provide the nozzle operator with critical flow performance.

Now, the next step: choosing the best nozzle to meet the agency's operational needs. From a features and benefits standpoint, we will review key performance criteria and offer benefits and drawbacks for each characteristic. Generally, choice of nozzle pressure regulation, type of shut off valve, fog tooth design, and pattern shaper configuration are the most critical elements examined during the primary evaluation.

## Nozzle Pressure Regulation

- **Fixed Litreage.** This nozzle style is designed to provide optimal straight stream and fog pattern performance at its rated pressure and flow. Over pressurisation of the nozzle creates unacceptable nozzle reaction for the operator, and under pressurisation produces an ineffective stream.
- **Selectable Litreage.** Optimal stream performance is achieved at the selected flow at the rated pressure. To maintain maximum stream performance when litreage selection changes are made during operations, corresponding changes must take place in the pump discharge pressure. Much like the fixed litreage design, over pressurisation of the nozzle at a given selection creates unacceptable nozzle reaction for the operator, while under pressurisation produces an ineffective stream.

- **Automatic.** Using a unique design that incorporates an internal spring and hydraulic balance, these nozzles provide optimal straight stream and fog pattern performance over the entire rated flow range at the rated pressure. These nozzles are commonly referred to as constant pressure/variable litreage nozzles and standards require that the nozzle's rated flow range and pressure be indicated on the labelling of the nozzle. The automatic nozzle's pressure regulation provides the nozzle operator consistent reach and penetration (even while gating of the nozzle) without changes in pump discharge pressure.
- **Automatic with Flow Limiting.** In addition to offering the same stream performance characteristics across a broad range of flows as the standard automatic nozzle, these nozzles incorporate a user-defined flow limiting selection restricting maximum flow. Some models also offer a fixed high flow setting at a reduced operational pressure.

In summary, there are many choices of flow and pressure regulation currently available. While the fixed and selectable litreage styles initially appear simplistic in nature, they rely heavily on predetermined and proper hydraulic and pumping operations to achieve and maintain the target flow during operations. Automatic, constant pressure/variable litreage nozzles can provide a level of simplicity and flexibility in rapidly changing fireground conditions thanks to their self-regulating design.

Rated nozzle pressures can also vary from 7bar to 5bar and even lower in many designs. While lower pressure (lower exit velocity) can reduce nozzle reaction somewhat for the nozzle operator, the reduced velocity of the stream will also provide less reach and penetration. When working with foam, lower operating pressure nozzles can often produce a higher expansion and longer lasting finished foam.

## Shut Off Valve Style

- **Ball Style Shut Off.** The most commonly used style of shut off, the ball valve design and all of its variations, is typically used in the fully open or fully closed position. Any gating of the valve to reduce flow or nozzle reaction during operation creates unwanted turbulence in the waterway resulting in a poorly performing straight stream and degraded fog pattern.
- **Slide Style Shut Off.** The slide valve style of shut off (similar in design to a needle and seat valve) allows the nozzle operator to vary the position of the valve without creating unwanted turbulence in the waterway. The nozzle valve can be gated to restrict flow, yet will maintain optimal stream performance in all positions.

Final choice of either the ball or slide type of valve should be accompanied with training and operational guidelines to support the creation and maintenance of optimum stream performance for the initial attack crew. With the ball style of valve being most common, hose handling techniques and pump pressure choices should be practiced to avoid the nozzle operator gating the ball valve and degrading the stream. When using a slide style of valve, nozzle training should stress that the nozzle operator has full control of flow, using a little when necessary, or opening the nozzle fully to achieve the targeted fire flow. In either case, choosing valve designs that incorporate time tested materials such as stainless steel has been proven to result in reduced maintenance costs and ensures your equipment's long term durability.

## Fog Tooth Design

- **Spinning Tooth.** Designed to provide a very wide protective fog pattern, the spinning tooth design is one of the most common designs used worldwide. With the water being directed to the outer portion of the pattern to gain the wide angle, a central hollow core typically exists with this style of design. This hollow central core can often draw heat, flame and smoke back towards the nozzle operator. The protective nature of the fog pattern can also be easily degraded if the teeth are prohibited from spinning due to debris, or if the teeth are bent, broken, or missing (making regular inspections imperative). Often stainless steel

spinning tooth construction is preferred over plastic for durability, long term reliability, and crew protection.

- **Moulded Rubber Tooth.** With a fixed tooth style, often the teeth are an integral part of the front bumper of the nozzle and are bonded to a metal shaper underneath to provide maximum durability. This style of tooth, which does not provide as wide a pattern as the spinning tooth design, directs water towards the central core of the fog pattern creating a fully filled fog pattern. This style of pattern tends to push heat, flame, and smoke ahead of the nozzle operator as the hose line is advanced on the fire.
- **Fixed Cut Metal Tooth.** This tooth configuration is a variation of the two previous designs and offers not only a fully filled pattern at a given selection, but when rotated further, will expand to a wide flat style of pattern more commonly recognized as a spinning tooth design. Cut from metal on the front of the nozzle bumper, this style of pattern is very rugged even in the harshest firefighting conditions.

Often pattern selection, just as using a nozzle with a pistol grip, is determined as much by past practices and the existing equipment in use as it is on the actual performance differences among the fog tooth designs and pattern styles. No matter which selection is made, safety of the nozzle team should be the number one consideration. The front of any nozzle is capable of seeing very harsh conditions and rugged use during firefighting operations. Regular inspection and repair of nozzles, specifically the components that provide the protective fog pattern is essential.

### Pattern Shaper Detent

- **Fixed Tactile Indicator.** These indicators, an integral component of the pattern shaping bumper, provide a visual and tactile indication of the stream pattern selection of the nozzle. When fixed, these indicators are typically set to the top of the nozzle when it is in the straight stream position.
- **Tactile Indicator with Pattern Detent.** This style of indicator incorporates an integrated detent ball within the pattern shaper and allows a set pattern selection to have a tactile and audible feel. This style allows a detent to be integrated at a given pattern selection, such as a partial fog position, which can be noted by the nozzle operator as the pattern shaper is rotated in dark or smoky conditions.
- **Tactile Indicator with Lock Out.** This style of indicator incorporates a lock setting that must be manually overridden by the nozzle operator to access other stream settings. An example of this would be to restrict the ability of the nozzle to go to straight stream to prevent plunging the stream into flammable liquids or, to prevent the nozzle operator from selecting a fog pattern position when entering an unventilated room and contents fire. The pattern can be easily overridden to choose other pattern selections.
- **Locked Tactile Indictor.** If no other pattern selection is desirable, the indicator can be locked into a predetermined pattern selection. This style will allow no other pattern selections by the operator. An example of this lock out choice is for nozzles designated for use on fires where energized electrical components may be present. A modified fog pattern may be the sole choice of the agency having authority.

Tactile indicators are an ideal choice for departments trying to meet individual operational performance criteria. Often international standards may dictate certain lock out configurations, and in other situations, just having the nozzle operator know, with the feel of a detent, that a pattern selection has been achieved is a critical operational consideration.

Possibly not as essential as the previously noted nozzle design elements, there are also other characteristics that should be considered when making a decision. Two-piece nozzles, ball shut off combined with a nozzle tip, can offer some additional tactical performance if the need to remove the tip and add additional hose line is required. This configuration is often found in departments who have specially designed hose bundles for high rise firefighting operations, or in areas where wildland fire operations are common. Equally important are international standards for nozzles that through either self-certification or third party testing can provide a level of performance and materials verification not easily accomplished at the fire department level.

In summary, the choice of the proper nozzle for the initial attack operations is not an easy process. But, with proper investigation, determining the agency's target fire flows, and identifying key performance criteria that are essential to the operations, the decision can be based more on facts, and less on just purchasing what the next latest, greatest and extensively marketed product may be. From a safety standpoint, choosing a rugged, time tested and factory supported product is essential. For additional information on nozzles, operational guidelines, or the newest in designs, the worldwide web offers countless opportunities. But, as a final suggestion; always use the nozzle you are considering in both demonstration and field evaluation. Only then can you be assured you are getting the best value for your investment. **APF**

**Rod Carringer** is the Chief Marketing Office at Task Force Tips

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**Scott Jones**

Pelican Products

# Lighting the Way

There has never been a more advantageous time to apply technology and performance to a fire fighter or rescue worker's personal lighting tools. Today's firefighter is responsible for more equipment than ever before. Due to the burdensome amounts of gear required to do the job, anything that allows for lighter and smaller profiles would certainly be welcomed.

One of the latest technological advances has entered into lighting tools, that being the transition from incandescent to the use of LEDs (light emitting diodes). LEDs have come a long way, transitioning from indicators to illuminators. We can all identify with the various uses of LEDs in our everyday life. It can be the little red light that shows your TV is on, the green light that tells you your computer is running or the blue light that reminds you your laundry is done. Today, we are seeing increased applications such as LEDs in traffic signals, tail lights of cars, trucks and buses as well as emergency lighting for fire, police and other emergency vehicles. These are all indicators.

There are many benefits that come with LEDs: they are not nearly as fragile as incandescent lamps, do not have a minimal life expectancy (some incandescent flashlight bulbs carry a life of 30 hours compared with 50,000 hours for many LEDs), and are more efficient with batteries and do not produce the high temperature levels seen with incandescent models.

With these added applications came a surge of attention by the LED manufacturers who have developed LEDs to go beyond being solely an indicator and become an illuminator. In the not too distant past the very first LED flashlights were small, amazingly bright keychain type lights (for an LED) that allowed for close-up uses like reading a document, lighting walk spaces, looking for keys in a purse or reading a menu in a romantically lit restaurant. The performance level achieved from LEDs used in personal lighting tools today have surpassed that of the previous versions and are looking to send the incandescent down the same path as the dinosaur and VCR. However, it is important to note that many of the legendary (incandescent) flashlight designs continue to serve a worthy purpose, as they maintain a price advantage over LEDs.

This technology has not only allowed for performance increases of upwards of four to five times the lumens, but has brought with it the ability to create new categories in lighting tools. LEDs are bright enough now to be used in portable area lights, which offer solutions never before seen. Not only are the lights cool-running but very durable. Mixed with a self-contained rechargeable battery, they allow for the elimination of generators, which bring extra bulk, fuels, exhaust, noise, cables and heat concerns.

In addition to the ever-increasing light output, the technology has allowed for increased efficiency of LEDs, which brings longer run times. So we are now seeing increases in lumen output and at the same time, seeing longer run times. This was perceived as impossible in the past, but due to electronic drivers used in LEDs, it is now possible.

Another topic crucial to the fire fighter and rescue person is lighting safety approvals. Because there is the potential for responding to any number of scenarios, it becomes prudent to consider a

safety-approved light. Due to the wide variety of environments there are a wide variety of approvals. All details regarding safety approvals are not covered in this article. Basics are provided and it is strongly recommended that further information be sought.

There are a variety of standards that exist and vary from country to country but we will use North America as a reference. Hazardous locations are categorised, following guidelines set down in the NEC (National Electric Code), by four criteria: Class – defines the nature of the potentially hazardous materials that are present; Division – classifies the likelihood of sufficient concentrations of the hazardous materials being present to pose a risk of fire or explosion; Group – categorises specific hazardous materials within each class by similarity of their properties or characteristics; and Ignition Temperature – hazardous materials according to the temperature at which they will ignite. One very good resource for a more in-depth explanation on safety approvals can be found at http://www.pelican.com/safety. There, you can review and download a safety approval white paper.

For some time, there has been a need to create a performance standard. In the past you may remember seeing flashlights reported in candlepower. This created a problem when trying to determine the performance as manufacturers were using a variety of different reporting methods and most end users were unaware of any candlepower rating system. Today flashlights are being reported in lumens, which is a measurable unit via a light sphere. The need for additional performance reporting such as run times, beam distance and water ingress, set the stage for a standard to be established.

So, in 2009 a variety of flashlight manufacturers collectively came together and created the first such standard, called the ANSI (American National Standards Institute)/NEMA (National Electrical Manufacturers Association) FL-1 standard. This standard covers a variety of performance areas, namely: light output, run time, beam distance, peak beam intensity, impact resistance and water resistance. There are icons used to reference each performance area and are identifiable by the ANSI FL 1 branding. This standard is adopted on a voluntary basis and is self regulated. It has proven to be of great value and can be referenced by any end user for consistent, reliable and comparable performance figures.

## Lighting Options

There are multiple applications for flashlights in the fire and rescue workplace. Some of the more common types are head lights, hand held, right angle (hands-free) and lantern style lights. When selecting a light you should consider the size, weight and performance of each. Again, today the technological advances have allowed for smaller, lighter weight, yet higher performance lights.

Handheld lights come in variety of shapes and sizes but AA (typically three to four cells) and C (typically two to three cells) alkalines are the common battery of choice. There are a variety of switch designs to consider. Some are one-hand-activated where others require two hands to activate but typically will offer a higher level of

water ingress protection. Another innovative feature is the use of photoluminescents (glow in the dark materials) that help locate an accidental loss of a light in the off position.

When considering a head light, it is best to avoid too heavy a light as it may put undue stress on your neck. An articulating head is beneficial because it allows the beam to be adjusted to the sought after angle. High beams and low beams are also a value as too much light in close up applications may be self-blinding and an unnecessary waste of battery life. Depending on preference and helmet style, a wide variety of straps and side attachments are available as the most common ways to secure it.

**What is important is that the potential hazardous environment is evaluated to determine what, if any, approval is needed prior to entering and match that with the appropriate light.**

Lantern style lights typically are heavier and larger in size but have the ability to produce a brighter light beam and supply a longer run time. There are new model lantern style lights now available that are substantially lighter in weight (3 time lighter in some cases), yet produce industry leading lumen performance. A lantern style light should enable a better penetrating beam for smoke filled conditions, use in crawling situations and can be used to mark an egress location, identifying a safe exit.

Right-angle flashlights are designed to offer a hands-free application. Certainly, there are many times when two hands are needed. In these situations, you are able to keep a path illuminated while working with other equipment. Some of the latest designs in right-angle lights offer multiple features such as high/low beams, downcast and signalling. The high beam would be used for maximum illumination where the low beam would allow for a reasonable amount of light but extend the battery life. The downcast light is used to illuminate a path to minimise stepping into any unwanted areas, as well as used when reading or writing reports without a blinding effect. Signalling, also a benefit can be used in a variety of applications.

Another noteworthy feature you will now see on firefighter and rescue worker lights is battery level indication. Seeing how the lights used in our industry are truly "tools of the trade" and instruments we rely on, it makes sense to have some form of battery level indication. You will see some lights have an illuminated switch that supplies the battery level with varying degrees of colour. For example, green would represent 100% to 50%, amber would represent 50% to 25% and red would represent below 25%. Other designs will have multiple LED indicators that diminish with use. Still others offer a flashing signal to indicate a low battery level. Regardless of the type, battery level indication is of great value.

Beyond head lights, hand held, right-angle and lantern lights is area lighting. Area lighting systems of the past were powered by noisy, polluting, fuel-driven generators that emitted toxic fumes and heat, posing serious safety problems in emergency sites. A superior alternative is area lighting that offers users the ability to illuminate large work areas without the fuel consumption, noise and air pollution associated with industrial diesel generator-powered lighting towers of the past. Lighting up ravines, confined spaces or any other place your apparatus can't go is made easy with the right area lighting system.

Now, more than ever, lighting products include increased options with improved performance and additional features, which makes it all the more critical to take extra care when choosing personal lighting tools. It could literally mean life or death for you and those you work to protect. **APF**

**Scott Jones** Product Manager at Pelican Products

For further information, go to www.pelican.com

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Sacred Heart cor. Kamagong Streets
San Antonio Village, Makati
Tel: (+632); 519-8375; 519-8376; 846-8344
Email: makati@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – ERMITA

ERMITA1362 A. Mabini Street
Unit 101-106 Joncor II Bldg.
Ermita, Manila
Tel: (632) 708 9990
Email: ermita@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – PUERTO GALERA

Sabang Beach, Oriental Mindoro
Puerto Galera
Tel: (6343) 287-3172
Email: puertogalera@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

## Cutters Edge

FIRE RESCUE SAWS

**CHINA**

### ANCOM SYSTEMS INC

Building 5, Courtyard 10 Village
Middle Road
North 3rd Ring Road
Beijing, PR 100011
Contact: Pei Zhang
Tel: 86 10 6202 2792
Fax: 86 10 6207 7929
Email: hung.fang@utoronto.ca
Website: www.ancom.cn
**Dealer/Distributor**

### NORLAN ENTERPRISES, INC

Room 952, #218 Tang Li Road
Chao Yang District
Beijing
PR 100012
Tel: 86 10 84673721
Fax: 86 10 84673770
Email: helenwang@norlan.cn
Website: www.norlan.cn
**Dealer/Distributor**

### WUXI NEW FIRETRE SAFETECH LTD

Block 3, Long Shan Wen Bo Industrial Park
Qian Yao Road
Hu Bin District
Wuxi, Jiangsu Provence
PR 214151
Tel: 86 510 8225 5991
Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com
**Dealer/Distributor**

**HONG KONG**

### TIAN YOU INTERNATIONAL DEV CO

Room 119, International Trade Centre
11-19 Sha Tsuo Road
Tsuen Wan
Hong Kong
Contact: Philip Shek
Tel: 852 24161241
Fax: 852 24169636
Email: info@tianyou.com.hk
**Dealer/Distributor**

**INDIA**

### ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar,
Sushil Muni Square
Shankar Road
New Delhi PIN – 110 060
India
Tel: 91 11 49458800
Fax: 91 11 49458844
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**INDONESIA**

**PT MITRA TEKNIKATAMA SUPPLINDO**
Jl Ekor Kuning No 1
Pasar Ikan
Penjaringan
Jakarta Utara 14440
Contact: Adelaide Sagitaria
Tel: 62 216602144
Fax: 62 216602146
Email: Adelaide@mitrateknikatama.com
**Dealer/Distributor**

**JAPAN**

**TEIKOKU SEN-I CO LTD**
5-13, 2 Chome
Nihonbashi
Chuo-Ku
Tokyo 103
Contact: Mr Satoh
Tel: 81 332813026
Fax: 81 332813090
Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
**Dealer/Distributor**

**MALAYASIA**

**CITO MARKETING, SDN BHD**
No 11
Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
Selangor
Darul Ehsan 47301
Contact: Abu Raihan Jaafar
Tel: 60 37311286
Fax: 60 37340583
Email: cito@po.jaring.my
**Dealer/Distributor**

**SJA TRADE & SERVICES, SDN BHD**
Kelana Center
Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor
Darul Ehsan 47301
Contact: Hetty Zurin Hamdan
Tel: 60 37847400
Fax: 60 37848500
**Dealer/Distributor**

**PHILLIPINES**

**SMARTGUARD PHILIPPINES, INC**
#16 Blk 4, 7th Street
Bacolod City
Negros Occidental 6100
Telefax: +63 34 7091549
Mobile: +63 918 8881729
Email: smartguardphilippines@yahoo.com
**Dealer/Distributor**

**SOUTH KOREA**

**JINUTEC INTERNATIONAL DIVISION**
711 Visiontop Officetel 374-4
Won-DongOsan City
Korea
Contact: Na Hae-Yul
Tel: 82 31 3758558
Fax: 82 31 3754884
Email: hyna@jinutec.com
Website: www.jinutec.com
**Dealer/Distributor**

**TAIWAN**

**ALL STRONG TRADING CO LTD**
No 110 Sec. 2
Chang An E Road
7th Fl. King Isian Bldg
PO Box 46-482
Taipei
Contact: K C Huang
Tel: 886 2250 79976
Fax: 886 2250 75253
Email: allstron@ms19.hinet.net
**Dealer/Distributor**

**PACIFIC CENTURY INDUSTRIAL CO LTD**
PO Box 55-719
6F-7 No, 21, Sec 3
Min-chung East Rd
Taipei
Contact: Ming Ko
Tel: 886 2251 77217
Fax: 886 2282 78101
Email: mingko@ms16.hinet.net
**Dealer/Distributor**

## Dräger

**AUSTRALIA**

**DRÄGER SAFETY PACIFIC PTY LTD**
8 Acacia Place
Notting Hill VIC 3168
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Fax: +61 3 9265 5095
Email: customer.service@draeger.com
Website: www.draeger.com
**Representative Office**

**CHINA**

**DRÄGER SAFETY EQUIPMENT (CHINA) CO LTD**
A22, Yun An Road, B Area
Tianzhu Airport Industrial Zone
Beijing 101300
Tel: +86 10 8049 8000 Ext. 213
Fax: +86 10 8049 8005
Email: sales.safety.cn@draeger.com
Website: www.draeger.com
**Representative Office**

**INDONESIA**

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Website: www.draeger.com
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**KOREA (SOUTH)**

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Website: www.draeger.com
**Representative Office**

**MALAYSIA**

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Website: www.draeger.com
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**DRÄGER SAFETY TAIWAN CO LTD**
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Chung Ho City 23586
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**THAILAND**

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**VIETNAM**

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Email: sales.safety.vn@draeger.com
Website: www.draeger.com
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## DR STHAMER HAMBURG

**SINGAPORE**

**TETRA FIRE ENGINEERING PTE LTD**
10 Ubi Crescent #05-04, Ubi Techpark
Singapore 408564
Contact: Mr T S Lee
Tel: (65) 6841 4429
Fax: (65) 6841 5267
Email: tetra@singnet.com.sg
**Dealer/Distributor**

**INDIA**

**M/S ASKA EQUIPMENTS LTD**
R-482, New Rajendra Nagar
Ganga Ram Hospital Square, Shankar Road
New Delhi – 110 060 India
Contact: Mr Harsh A Garg – Director
(All India Sales)
Tel: 011 494458800
Mobile: +91 11949458844
Fax: 011 27014413
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**TAIWAN**

**PAO TAI LNTERNATIONAL ENTERPRISE LTD**
No.39, Lane 177, Dahua Rd
Jhongli City, Taoyuan County 320
Taiwan (R.O.C.)
Contact: Mr Sunter Sun
Mobile: 0933-114-090
Fax: 886-3-4632376
**Dealer/Distributor**

## Fike

**AUSTRALIA**

**FIRE PROTECTION TECHNOLOGIES PTY LTD**
Unit 1/251, Ferntree Gully Road
PO Box 75, Mt Waverley
Victoria 3149, Australia
Tel: +61 3 8542 8901
Fax: +61 3 9543 9109
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au
**Dealer/Distributor**

**BANGLADESH**

**MARS SYNDICATE**
114A, New DOHS, Eastern Rd. Lane #6
Mohakhali Dhaka # 1206
Bangladesh
Contact: Ms Purabi Matin CEO/
Mr Akm Rasid Hassan Technical
Tel: +88 02-882 6893/+88 018-1922 6281
Email: marssyndicate@gmail.com
**Dealer/Distributor**

**CHINA**

### I-SAFE FIRE EQUIPMENT (TIANJIN) LTD

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Jin Nan District, Tian Jin, P.R. China
Tel: +86 22 8882 6965
Fax: +86 22 8882 6970
Email: sales@isafe-fire.com
**Dealer/Distributor**

**HONG KONG**

### THE JARDINE ENGINEERING CORPORATION LTD

5/F Tower A, Manulife Financial, 223-231 Wai Yip Street
Kwun Tong, Kowloon, Hong Kong
Tel: 852 2807 4684
Fax: 852 2503 4210
Email: tommy.tam@jec.com
Website: www.jec.com
**Dealer/Distributor**

**INDIA**

### NEWAGE FIRE PROTECTION ENGINEERS

7, Champaklal Udyong Bhavan
Sion (E) Mumbai 400 022, India
Tel: +91 22 2407 7421
Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com
**Dealer/Distributor**

**INDONESIA**

### PT. KALIMUTU MITRA PERKASA

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Fax: +62 21 5696 0497
Email: suastika@kalimutu.com
**Dealer/Distributor**

### PT. KENCANA LINTAS MENTARI

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Tel: +62 21 628 1933
Fax: +62 21 628 1976
Email: priyana@cbn.net.id
**Dealer/Distributor**

**KOREA**

### GM ENGINEERING & SUPERVISION CO LTD

Unit D-1209, Gwangmyeong Techno Park
#60 Haan-ro, Gwangmyeong-si
Gyeonggi-do, Korea
Tel: (82) 02-844-8588
Fax: (82) 02-846-9767
Mobile: (82) 010-5036-3123
Email: ts.jeong@gmens.co.kr
**Dealer/Distributor**

**MALAYSIA**

### FIKE ASIA PACIFIC SDN BHD

18B, 2nd Floor, Jalan Astak L U8/L
Bukit Jelutong, 40150 Shah Alam, Selangor, Malaysia
Tel: +60 3 7859 1462
Fax: +60 3 7859 1461
Email: chun-wah.leong@fike.com
Website: www.fike.com
**Representative Office**

### SUKIADA ENGINEERING SDN BHD

No. 20 Jalan Astaka L U8/L, Bukit Jelutong
40150 Shah Alam, Selangor, Malaysia
Tel: +60 3 7845 2008
Fax: +60 3 7845 6008
Email: bkwong@sukiada.com.my
Website: www.sukiada.com.my
**Dealer/Distributor**

**NEW ZEALAND**

### FIRE PROTECTION TECHNOLOGIES LTD

Unit B1, 8 Henry Rose Place, Albany 0632
North Shore, Auckland, New Zealand
Tel: +64 (09) 415 5488
Fax: +64 (09) 443 7867
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

**PAKISTAN**

### MGH ENGINEERING AND CONTROL PVT LTD

H. # 20 St., #5/A Kot Shahabdin
Shahdrah, Lahore 54950, Pakistan
Tel: +92 42 7913064
Fax: +92 42 7913064
Email: mansoorshaker@yahoo.com
Website: www.mgheng.com
**Dealer/Distributor**

**PHILIPPINES**

### FIRE SOLUTIONS INC

1028 Malaya Street, Malanday Marikina City
1805 Philippines
Tel: +63 2 371 9774
Fax: +63 2 374 3041
Email: firesolutions@skyinet.net
**Dealer/Distributor**

**SINGAPORE**

### AZCEND ASIA PTE LTD

Blk 21, Kallang Avenue #04-165
Singapore 339412
Tel: (65) 6299 0798
Fax: (65) 6299 3735
Email: Chiaw.fs@azcendasia.sg
**Dealer/Distributor**

**SRI LANKA**

### BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD

122, Dawson Street, Colombo 02, Sri Lanka
Tel: +94 11 4717 500
Fax: +94 11 245 4653
Email: bldserv@sltnet.lk
**Dealer/Distributor**

**TAIWAN**

### SUNMORN INC

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Taipei 10352, Taiwan
Tel: +886 2 2550 3500
Fax: +886 2 2550 5350
Email: merylyu@sunmoreinc.com
Website: www.sunmoreinc.com
**Dealer/Distributor**

**THAILAND**

### ANTI-FIRE CO LTD

316-316/1, Sukhumvit 22 Road
Klongtoey, Bangkok 10110, Thailand
Tel: +66 2 260 4565
Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com
**Dealer/Distributor**

**VIETNAM**

### EUROPEAN TECH JSC

No. 50, 218/27, Lac Long Quan Street
Tay Ho Dist., Hanoi, Vietnam
Tel: +84 4 3755 7179
Fax: +84 4 3755 7178
Email: mscee@vnn.vn
**Dealer/Distributor**

## FIRE FIGHTING ENTERPRISES

**AUSTRALIA**

### AMPAC TECHNOLOGY PTY LTD

7 Ledgar Road, Balcatta, Western Australia 6021
Tel: +618 9242 3333
Fax: +618 9242 3334
Website: www.ampac.net
**Dealer/Distributor**

**KOREA**

### HI MAX CO LTD

Sicox Tower, 115-Ho 513-14, Sangdaewon-Dong
Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
Tel: +82 742 1190
Fax: +82 742 7698
Email: himax@himax119.co.kr
Website: www.himax119.co.kr
**Dealer/Distributor**

**NEW ZEALAND**

### AMPAC INDUSTRIES LTD

PO Box 100-149, North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072
Fax: +64 94438073
**Dealer/Distributor**

**SINGAPORE**

### ACCLAIM SYSTEMS PTE LTD

Blk 104, Boon Keng Road, 05-01
Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
**Dealer/Distributor**

### ALARM SUPPLY PTE LTD

63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
**Dealer/Distributor**

**TAIWAN**

### HORING LIH IND CO LTD

4f No 18 Lane 327 Chung Shan Road
Sec 2, Chung-Ho-City
Taipei Hsien, Taiwan
Tel: +886 2224 87599
Fax: +886 2224 07752
**Dealer/Distributor**

**THAILAND**

### TEEYA MASTER SYSTS CO LTD

100/101-102 Vongvanji, Building B, 30th Flr
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: +662 2 6451130
Fax: +662 2 2488540
**Dealer/Distributor**

## FLIR SYSTEMS CO LTD

**HONG KONG**

### FLIR SYSTEMS CO LTD

Rm 1613-16, 16/F Tower 2, Grand Central Plaza
No 138 Shatin Rural Commitee Road
Shatin, New Territories, Hong Kong
Tel: +852 2792 8955
Fax: +852 2792 8952
Email: flir@flir.com.hk
Website: www.flir.com
**Representative Office**

## HD FIRE PROTECT PVT LTD

**AUSTRALIA**

### HD FIRE PROTECT PTY LTD

58/37, Slobodian Avenue, Eight Mile Plains
QLD – 4113, Australia
Tel: +61 433 194 344
Email: pacific@hdfire.com
**Representative Office**

**INDIA**

### HD FIRE PROTECT PVT LTD

C-36, Nandanvan Industrial Estate
Lal Bahadur Shastri Marg
Opposite ACC Research Centre
Thane, Mumbai, Maharashtra 400604, India
Tel: +91 22 2582 6958
Email: info@hdfire.com
Website: www.hdfire.com
**Representative Office**

**INDONESIA**

### PT. TRIMITA WUJUD REKANUSA

Jl. Gunung Sahari Raya 51/8
Jakarta Pusat 10610, Indonesia
Tel: +62 21 4227632
Email: exports@hdfire.com
**Dealer/Distributor**

## HOLMATRO

**AUSTRALIA**

### CHUBB FIRE & SECURITY

149-155 Milton St Ashfield
NSW 2131 Australia
Tel: +61 392 649 796
Email: Joan.Lambert@chubb.com.au
Website: http://www.chubb.com.au
**Dealer/Distributor**

**BANGLADESH**

### SPERRY INTERNATIONAL

5/5 Block-A, 1st Floor
Iqbal Road Mohammedpur Dhaka-1207
Bangladesh
Tel: +88 029 110 264
Email: SMNazrul@sam-sperry.com
Website: http://www.sam-sperry.com
**Dealer/Distributor**

**BHUTAN**

### TCD TRADER
PO Box 792 Changjalu, Thimphu Bhutan
Tel: +975 178 328 53
Email: TDorji212@gmail.com
Website: http://www.tcdtrader.com
**Dealer/Distributor**

**BRUNEI**

### IECS
8A Simpang 558, Jalan Pasir Kampong Berakas
BB1314 Brunei Darussalam
Tel: +673 877 79 68
Email: IECS.Brunei@gmail.com
**Dealer/Distributor**

**CAMBODIA**

### FIRESAFE CAMBODIA
165 Sotheros blvd, Phnom Penh Cambodia
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Website: http://www.firesafecambodia.com
**Dealer/Distributor**

**CHINA**

### HOLMATRO CHINA
No 1801, Pangjin Road
Wujiang ETDC 215200 Suzhou, China
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**FIJI**

### PIONEER SUPPLIES
161 Toorak Road Suva Fiji Islands
Tel: +679 331 27 37
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**Dealer/Distributor**

**HONG KONG**

### ABLESLINK COMPANY
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**INDIA**

### RESQ TECHNOLOGIES
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Website: http://www.resqtechnologies.com
**Dealer/Distributor**

**INDONESIA**

### ESA KARYA MANDIRI
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**JAPAN**

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**KOREA**

### KYUNG JIN INTERNATIONAL
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**MACAU**

### TCT TRI-CONTINENTAL TRADING
4/F-E, Dynasty Plaza Bldg.
411-417 Ald. Dr. C.
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Email: TCT@macau.ctm.net
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**MALAYSIA**

### PANDAN NIAGA
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**Dealer/Distributor**

**MONGOLIA**

### NANOPLANET
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10th Khoroolol
Bayangol District
Ulaanbaatar 16081 Mongolia
Tel: +976 88 09 66 48
Email: info@planet-mongolia.com
Website: http://www.nano.planet-mongolia.com
**Dealer/Distributor**

**NEW ZEALAND**

### CHUBB FIRE & SAFETY PRODUCTS
3 Fisher Crescent (Private Bag 92207)
Mt Wellington Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: http://www.chubb.co.nz
**Dealer/Distributor**

**PAKISTAN**

### HASEEN HABIB TRADING
7, Shaheen View, Block 6
PECHS Main Shahrae Faisal
Karachi Pakistan
Tel: +92 213 452 62 40
Email: FBarry@haseenhabib.com
Website: http://www.haseenhabib.com
**Dealer/Distributor**

**PHILIPPINES**

### WALLGREEN INDUSTRIAL VENTURES CORP
62 West Avenue
Quezon City 1104 Philippines
Tel: +63 241 108 18
Email: WIVCOR@yahoo.com
**Dealer/Distributor**

**SINGAPORE**

### ADVENTRA
48 Changi South St. 1 486130 Singapore
Singapore
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Email: PK.Tan@adventra.com.sg
Website: http://www.adventra.com.sg
**Dealer/Distributor**

**SRI LANKA**

### HALCHEM LANKA
No.07, Siri Dhamma Mawatha
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Website: http://www.halchem.net
**Dealer/Distributor**

**TAIWAN**

### PARKSON TRADING
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**THAILAND**

### CHASE ENTERPRISE (SIAM)
497 Prapinklao Road, Bangyeekhan, Bangplad
Bangkok 10700 Thailand
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Email: ChaseSiam@chasesiam.com
Website: http://www.chasesiam.com
**Dealer/Distributor**

**VIETNAM**

### WETEC TECHNOLOGY EQUIPMENT
10th Floor, 9 Lang Ha
Ba Dinh District Hanoi Vietnam
Tel: +84 945 582 626
Email: Khoa.TD@wetec.vn
Website: http://www.wetec.vn
**Dealer/Distributor**

## HUSQVARNA CONSTRUCTION PRODUCTS

**AUSTRALIA**

### HUSQVARNA AUSTRALIA PTY LTD
4 Pioneer Ave,
Tuggerah, NSW 2259, Australia
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**CHINA**

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**APF IS PUBLISHED 4 TIMES A YEAR – MARCH, JUNE, SEPTEMBER AND DECEMBER**

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## ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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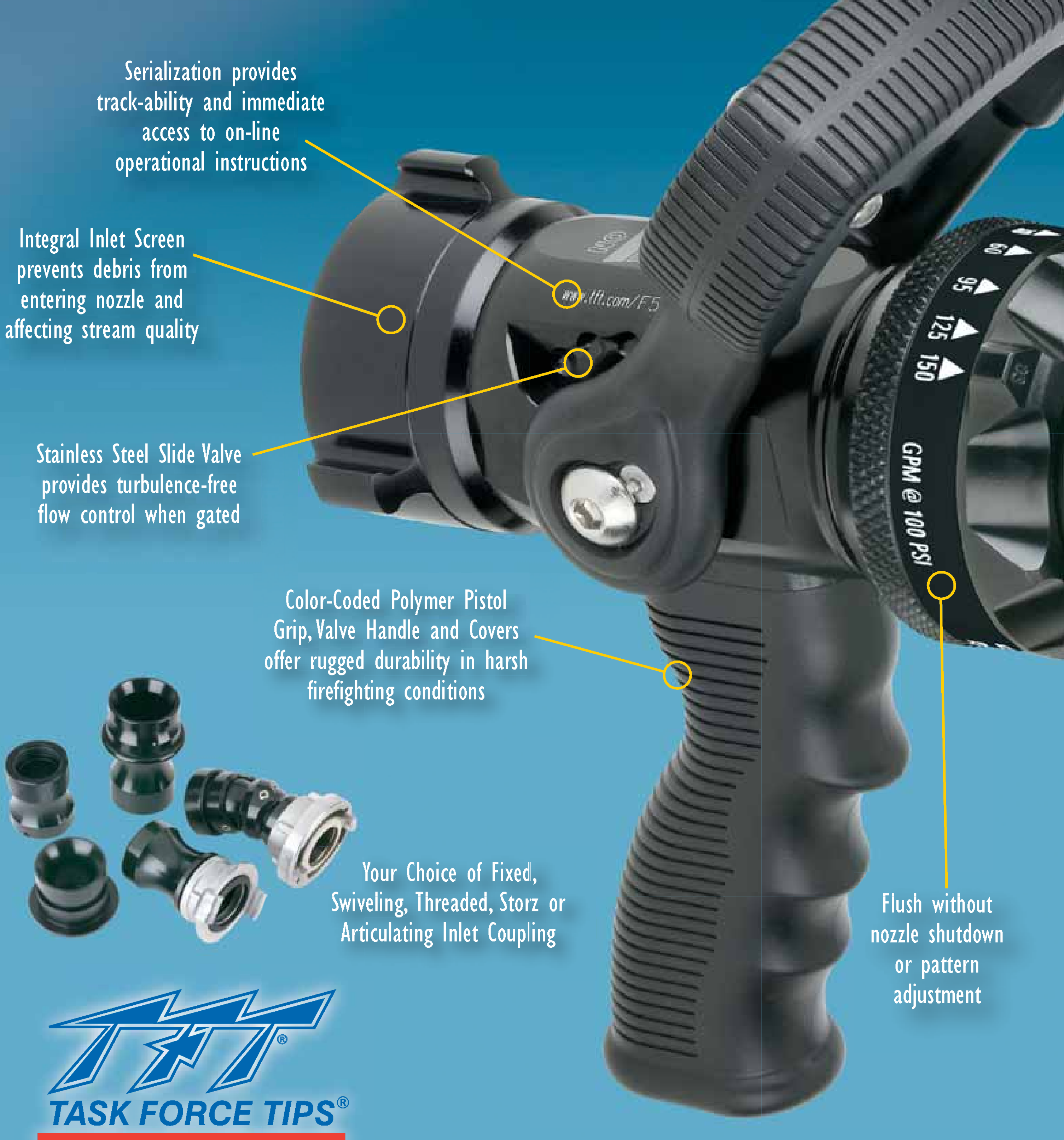

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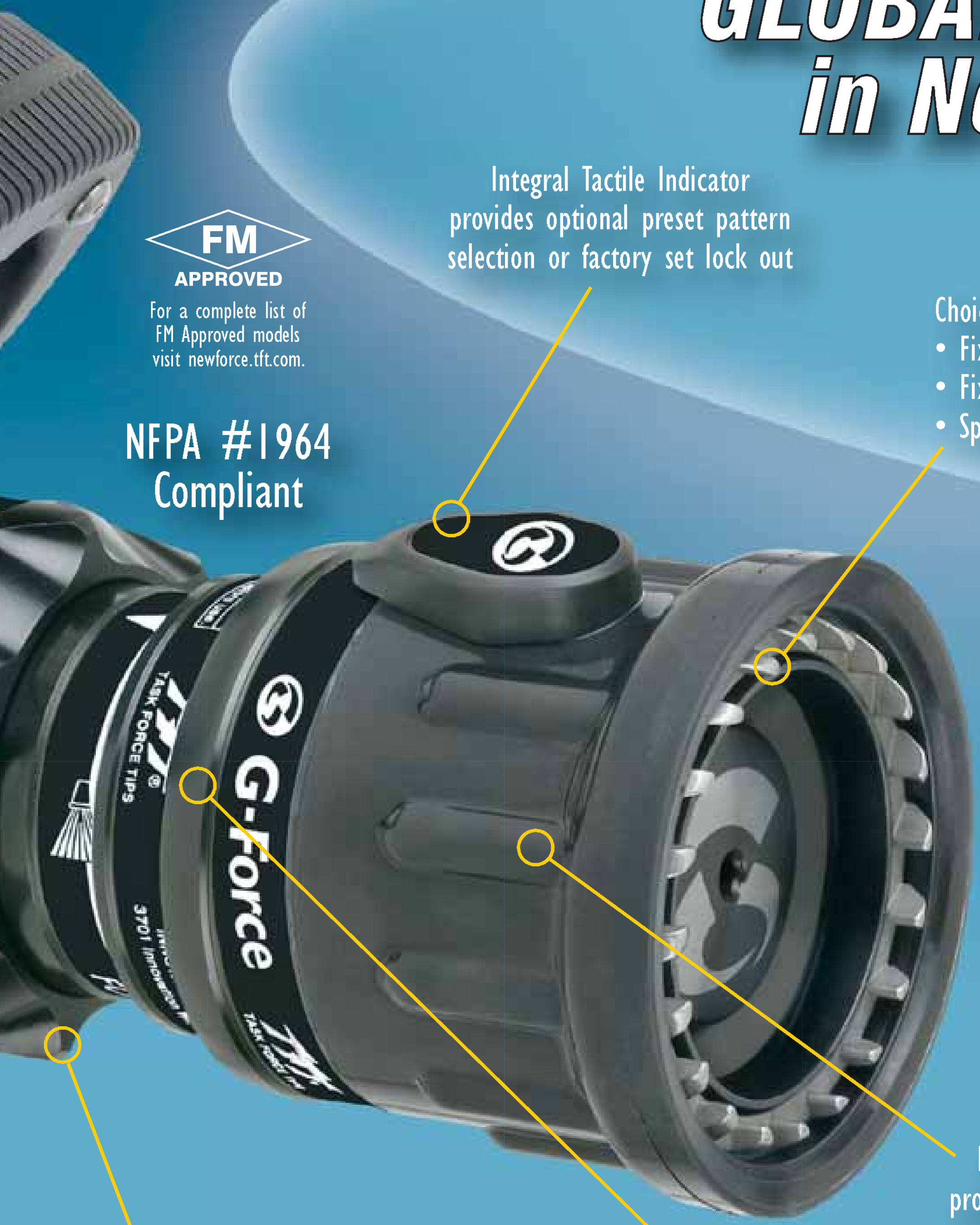

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**December 2013**
**Issue 48**

APF
An MDM PUBLICATION
Issue 48 – December 2013
www.mdmpublishing.com
ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Front cover: Airservices recently opened A$20 million Learning Academy Hot Fire Training Ground for Aviation Rescue and Fire Fighting (ARFF) firefighters at Melbourne Airport in Australia.

Publishers
Mark Seton & David Staddon

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APF is published quarterly by:
MDM Publishing Ltd
The Abbey Manor Business Centre,
The Abbey, Preston Road, Yeovil,
Somerset BA20 2EN, United Kingdom
Tel: +44 (0) 1935 426 428
Fax: +44 (0) 1935 426 926
Email: mark.seton@apfmag.com
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ISSN – 1476-1386

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Page design by Dorchester Typesetting Group Ltd
Printed in the UK

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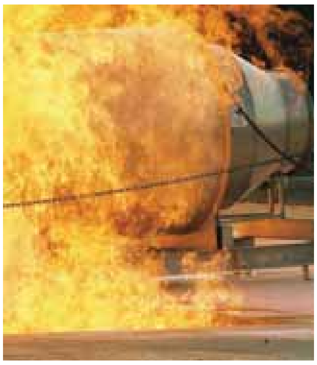
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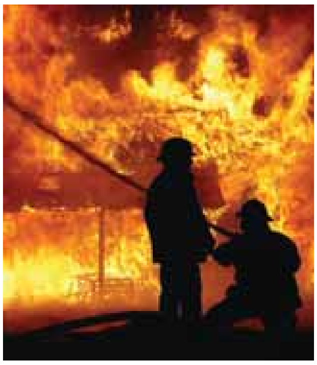
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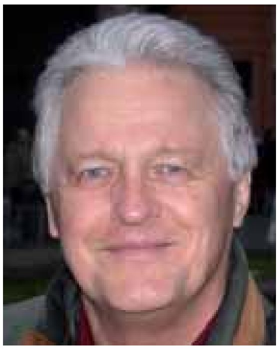

**Graham Collins**

Email: graham.collins@mdmpublishing.com

# It May Be When, Not If

A few months ago I wrote in the editorial page of this magazine about the exponential increase in natural disasters that is taking place around the world. Little did I know at the time of the devastation that the typhoon that struck the Philippines and obliterated entire cities would cause.

Authorities in the Philippines currently estimate more than 3,900 people were killed when Typhoon Haiyan made landfall on the 8th November and the sea surged ashore. However, estimates of the death toll have varied widely, and the governor of worst-hit Leyte province reckons that more than 4,000 people could have been killed on the island of Leyte alone.

Some weeks before Typhoon Haiyan struck, I paradoxically had the unexpected opportunity to do some straw-poll research with a reasonable cross-section of the Asia Pacific public to get some idea of their perception of the risk of natural disasters and their likely response. It cast some light – for me at least – on why we appear to be collectively oblivious to such threats. Sadly, the findings were only a partial surprise.

**When asked what his or her attitude is to the risk of an earthquake or tsunami striking, the guy in the street seems to need a degree of certainty even to be slightly concerned.**

I had some expectation, with growing awareness of the size and frequency of natural disasters in this part of the world, that there would be some concern. Tell them that an earthquake or tsunami will definitely strike in the next week and action, not to mention anger that nothing had been done to mitigate the impact, is much in evidence. They would "head for the hills". Tell them that the expectation is in five years' time, and the response is more subdued; to wait and see for the next four or so years for an updated assessment of the risk.

It then follows the same pattern. Ten years means no decisions or action for eight or nine years; 20 years, and it is pushed out to 18 or 19 years. Beyond that timescale the attitude could be summed up as "we'll, I've had a good life".

So, you could sum up the guy in the street's attitude as being that he or she needs a degree of certainty even to be slightly concerned. But is it good enough to accept this attitude from those who have asked us to vote them into political office, or from those responsible for emergency planning that hold positions of real influence? We hear frequently the opinion expressed that politicians seem to care little for anything beyond the next election so, if this view has any validity, the prospect of them thinking for generations or centuries ahead is remote in the extreme. The risk is too distant, too vague, and the challenge is too great and far too expensive to resolve.

But the reality is that steps can be taken right now that are common sense and are not necessarily budget breaking. The world's leading scientists tell us loudly and clearly that environmental factors are influencing weather, so action on damage to the environmental is the starting point. In addition, measures such as stop giving planning consent for shore-side developments that rising sea levels alone are putting at risk, and banning all developments in flood plain areas are just two measures that could be adopted.

Okay, it was only a straw poll and of absolutely no statistical significance. But if my straw-poll findings are even remotely representative, and even though the public may well not be clambering for action, it is too easy a cop-out for politicians to say that the electorate is not concerned; the primary task for which politicians are elected is to keep the population safe. And surely that should include some thought at least for distant future generations? But then, maybe it is closer generations that are at imminent risk, because who knows where the next mega-Typhoon will hit in the Asia Pacific region? And who knows when? APF

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**Kathleen Almand**

Executive Director,
Research Foundation

# Human Behaviour and Fire Safety

Last summer I travelled to London to attend Interflam, a global research conference on fire safety science and engineering. The work of the Fire Protection Research Foundation is driven by the needs of NFPA technical committees, and is, thus, very applied in nature. The conference was a rare opportunity for me to spend some time considering more purely scientific research.

Based on the size of the conference and the number of young researchers in attendance, the fire science research community is thriving. Researchers from around the world presented more than 100 papers to more than 350 global participants, and this variety and international flavour is very encouraging. Despite reported cutbacks in government-funded research, the growth of the academic programs in fire protection and fire safety engineering worldwide is bringing a fresh set of research resources to the problems of fire safety. The Asia-Pacific region was well represented in the conference program with papers from Australia, China, India, Japan, Korea, New Zealand and Taiwan.

One thing that particularly struck me was the exponential growth of work that seeks to apply the understanding of human behaviour to improving fire safety. The program included 14 presentations by researchers from 11 different countries on this topic during the three-day conference; an astonishing development in the eyes of a structural engineer like me who continues to find much of human behaviour mystifying. In my view, the nature of this work has changed from observational research – the how and why of behaviour in a fire – to the application of that work to fire safety design and even to the codification of safety provisions in our codes and standards. NFPA is interested in learning what other countries are doing in this field and collaborating on areas of mutual interest.

NFPA's Fire Analysis and Research Division, in particular Rita Fahy, manager of fire databases and systems, has had a long-standing interest in this area and is assuming a leadership role in this discipline. The Society of Fire Protection Engineers and the International Standards Organization both have active programs to integrate the quantification of certain aspects of human behaviour, particularly egress, into engineering methods, and NFPA has incorporated new work on human behaviour into our codes and standards.

International research on human behaviour in tunnels, for example, is informing provisions in *NFPA 130, Fixed Guideway Transit and Passenger Rail Systems.* The Fire Protection Research Foundation recently sponsored a variety of projects on this topic, including work to support the development of provisions associated with the use of elevators combined with stairways in mixed evacuation strategies; to support the development of effective emergency messaging strategies for buildings and campuses in response to various threats; and to improve our understanding of human response to new light sources proposed for strobe emergency signals.

**One of the most challenging aspects of integrating human behaviour into design and codes and standards, is its high variability. But today's enhanced numerical methods and computing capability have helped transform this fascinating but very challenging aspect of fire safety science into a design variable that can be used in a number of different ways. We should applaud NFPA's leaders who decades ago recognised the future importance of the science of human behaviour.**

One of the most challenging aspects of integrating human behaviour into design, as well as into codes and standards, is its high variability. But today's enhanced numerical methods and computing capability have helped transform this fascinating but very challenging aspect of fire safety science into a design variable that can be used in a number of different ways.

When we consider this process, we should applaud NFPA's leaders who decades ago had the foresight to recognise the future importance of the science of human behaviour and helped lay the groundwork for NFPA, and all who use its codes and standards, to benefit from it. APF

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This article appeared originally in the September/October 2013 issue of the NFPA Journal.

For further information, go to www.nfpa.com

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# New PPE Integrated Safety Harness

BRISTOL UNIFORMS has designed a complete body safety harness for firefighters when required to work at height that is fully integrated into structural firefighter garments affording improved wearer comfort in a single garment meeting EN469:2005 Level 2 protection. This is seen as a significant advance on the typical means of providing added safety for firefighters when required to work at height, which has been the use of an external harness designed to fit over the PPE being worn for the task in hand, requiring the firefighter to don and doff two separate items of clothing. Bristol says that its design makes for a much more compact solution with fewer harness components exposed to damage or snagging during operations, as most of the supporting components are enclosed within, or under, the fabric layers of both coat and trouser.

The new harness is available as an option with Bristol's Ergotech Action, XFlex and RescueFlex designs. The seat harness is fitted around the waist of the trouser using a series of belt loops, while the leg straps are integrated inside the layers of the trouser with adjustment through Velcro openings either side of the front fly. The harness can be removed and replaced to facilitate cleaning and inspection through an internal horizontal inspection zip at the rear of the trouser, complying with both CE EN 813 and CE EN 358 standards.

Where a chest harness is also required, the fire coat has a special opening on the front to provide access to the central caribiner, allowing the chest harness to be attached to the seat harness to offer full fall arrest protection. This is CE certified to the fall arrest standard EN 361 when used with the seat harness. It is also certified to UIAA and EN 12277 chest harness standards.

**For more information, go to www.bristoluniforms.co.uk**

# New Sprinkler Standard

STANDARDS NEW ZEALAND has published a new fire protection standard, NZS 4541:2013 (Automatic fire sprinkler systems). It provides an integrated set of rules for the design, installation, and maintenance of sprinkler systems so that the systems reliably protect against the loss of life and minimise property damage from fire. This revised edition of NZS 4541 supersedes NZS 4541:2007.

**For more information, go to www.standards.co.nz**

# Water Mist Seminar to be held at Intersec

The INTERNATIONAL WATER MIST ASSOCIATION (IWMA) is organising a seminar during Intersec in Dubai in January 2014. The programme will be different from last year's event but is planned to be just as educational and interesting and will provide a general overview of water mist technology. There will be sessions on the basic physics behind and the characterisation of water mist and case studies to show how and where water mist can be integrated.

According to Bettina McDowell, IWMA Association Secretary, the IWMA holds most of its events in Europe, but is very much aware of the fact that the future of water mist is very promising in those countries where water is scarce. At the Dubai seminar, the Association particularly wishes to address interested parties from Asia and the Middle East region.

The IWMA plans to also hold seminars in the UK, Sweden and Germany during 2014, and The International Water Mist Conference will be held in Istanbul between the 21st and 23rd October 2014.

**For more information, go to www.iwma.net**

# New Explosion-proof Sounder Range

E2S has introduced a new option for its BEx range of explosion proof sounders. A new design of output horn turns the sound 90 degrees into a radial, omni-directional pattern without reducing the unit's sound output levels. This is particularly suited to combined sounder/beacon units that are normally installed with the beacon at the top and the horn facing downwards so that the sound output is pointing directly at the floor, limiting its range and impact. In addition to improving the effectiveness of the BEx combined units, the radial horn offers a smaller footprint than the directional unit, allowing the units to be installed in locations where space is restricted.

The new "-R" version can be specified for all existing BEx sounders and combination units. The four-stage, 45 tone BEx range is available in both EEx d and EEx de ratings, and is approved for use in gas Zones 1 and 2 and dust Zones 21 and 22. The range consists of 117 dB at one metre and 123 dB at one metre sounders, Hootronic versions that faithfully mimic the traditional electromechanical siren, buzzer and bell, 15 Watt and 25 Watt loudspeakers and five, 10, 15 and 21 Joule beacons.

**For more information, go to www.e2s.com/product-search?product=radial+horn**

# Test Station Ensures Gas Detector's Compliance

Bump testing (gas testing) standards globally are becoming ever-stricter and the demands on fleet managers to control bump and calibration records are increasingly stringent. The new CROWCON I-Test bump testing and calibration station aims to simplify this process as much as possible and is designed specifically to test and verify that Crowcon's Gas-Pro portable gas detectors are in a compliant state.

With the I-Test there is no requirement to turn the test gas on and off – a flow regulator automatically pulls in the correct amount and concentration of gas for each bump. The I-Test also starts automatically as soon as a Gas-Pro detector is inserted, without the need to press any buttons. The device then verifies that all gas sensors are responding to a known value of gas and that the filters are clear and good for use. It also tests that audible and visual alarms are working, giving the user full confidence that a unit is compliant for site use. In addition, the I-Test informs the operator if a gas cylinder is empty or has expired.

The accompanying I-Test Manager software tracks which Gas-Pro units need calibrating and allows storage, interrogation and convenient presentation of large amounts of bump testing data. Calibration certificates are automatically created and stored and many different types of reports and graphs can be created for easy interpretation. All this information is then easily accessible for audit and compliance purposes.

**For more information, go to www.crowcon.com**

# Water Enhancer in New Zealand

TetraKO, LLC, the fire suppression subsidiary of EARTHCLEAN CORPORATION has appointed Wormald as its the exclusive TetraKO water enhancer distributor for New Zealand. TetraKO water enhancer is biodegradable and non-toxic, and its dual thickening agent allows it to adhere and stay where applied. When heated by fire, TetraKO becomes even thicker and releases a cooler dry steam, dramatically aiding in fire suppression.

**For more information, go to www.tetraKO.com**

# New Impact Challenges

A new application, IMPACT CHALLENGES, combines short-form scenario based on-line exercises with SMS alerts and email notifications to offer what is described as an innovative, interactive and effective ongoing learning platform. All this can be done with an App on an IPad or smart phone, or on a PC. By filling a gap between formal practical training and on-line learning, Impact Challenges allows a variety of realistic micro scenarios to be developed and regularly exercised, teams to be developed, and mentors to be engaged and share experiences.

Scenarios range from commander level strategic decision-making challenges through to basic safety skills. For example, after students have finished a first-aid course, first-aid challenges can be issued to course members, their answers assessed and feedback provided by skilled practitioners, allowing for continual training and skills maintenance.

**For more information, go to www.impactchallenges.com**

# System Boosts Hose Laying & Recovery

The CFA's (Country Fire Authority) Scoresby Fire Brigade in the south-east suburb of Melbourne, state capital of Victoria in Australia, has replaced its hose layer truck with a HYTRANS hose layer and recovery system. The new system will support CFA when water transport over longer distance is required, freeing up resources and manpower for other urgent operations.

With their new hose layer, only one person is needed to lay hose at up to 40 kilometres-an-hour, so 2,000 metres of large diameter hose can be laid in less than five minutes. It takes three people to recover the hose at a speed of about one kilometre every 30 minutes, although during recent training the CFA Scoresby volunteers managed the recovery faster.

Mechanised hose recovery makes it possible to use larger hose, which otherwise would be too heavy to manhandle, which accounts for the trend for fire brigades to increasingly use hoses up to 150mm. The CFA Scoresby hose layer container holds just over 2,000 metres of 100mm hose.

**For more information, go to www.ffti.com.au**

**Tom Hainsworth**

# The Times are Changing for PPE

There are major themes emerging that will drive the personal protective equipment (PPE) market over the next few years on an international level. One of the biggest is the growing consensus that there needs to be greater interoperability, not just between different fire services but also between the Blue Light services as a whole.

The potential for cost savings is at the heart of this debate. However, other drivers include the benefit of greater collaboration and improved efficiencies in the way that emergency services respond to today's challenges.

The report "Facing the Future", written by Sir Ken Knight, a former chief fire officer in the UK, made the call for greater interoperability and working towards a unified fire and rescue service in England. A month before his report hit the desks of Government Ministers, the eight regional fire services in Scotland had taken the giant leap of joining forces into one single organisation. For other countries around the world, the idea of greater collaboration between Blue Light services is increasingly well established.

Every aspect of how fire services go about their job is coming under scrutiny, all of which has significant implications for the PPE market globally and it is essential that industry leaders, such as Hainsworth, are able to meet the changing demands.

With increasing moves towards interoperability, companies have to take into account the overall emergency response capability rather than looking narrowly at the specific needs of fire, police and ambulance as was previously the case. While greater collaboration will take time to come about, it is important that we are looking ahead to ten to 15 years' time.

That is why leading fabric producers, garment manufacturers and other specialists involved in the PPE industry are also forming part of the collaboration process to ensure that they are fully aligned with the thinking of senior fire, ambulance and police personnel.

The job of the firefighter is becoming more targeted, which means that the kit needs to meet a range of specific needs.

A number of fire services are now looking at moving towards layered firefighting personal protective equipment; a move that is an acknowledgement that the traditional structural fire kit used at road traffic collisions, car fires or flooding, is too bulky, heavy and thermally inefficient. The kit remains essential when tackling a burning building, but the workload of the modern firefighter is these days more diverse than ever.

Layering is about understanding this diversity and analysing the precise intervention requirements with the firefighter given the flexibility to be able to layer up according to the level of risk involved.

An incredible amount of attention to detail goes into the creation of today's PPE and

Hainsworth has been involved in the manufacture of firefighting garments for more than a century. We have come a long way since the first woollen jackets of the late 1800s that provided excellent shielding but were notoriously heavy and exhausting for the wearer.

But we also have a responsibility to continue to push boundaries and explore new ways of doing things. We do this in a number of ways including the work of our own fully accredited laboratory where work centres on textile innovation, while representatives of Hainsworth are proud to sit on a number of the standards committees around the world.

Collaboration really is essential because a complete understanding is not held by any individual fire service or member of the supply chain. For example, a firefighter needs to have an understanding of dynamic risk assessment so he can make the right call, the garment manufacturer needs to understand fit, comfort and the relationship between that and protection, while a fabric innovator, such as Hainsworth, needs to have an appreciation of all of these requirements as well as an in-depth understanding of how different fibres react in different environments.

There will undoubtedly be many changes over the next decade both in the way firefighters go about their work, the kind of incidents they are called out to and the kit they are given to do the job. But the end goal will remain the same, namely to ensure that the garments worn by our fire and other emergency services in all the different scenarios they face offer the best possible protection. APF

For more information, go to www.protectsyou.co.uk

# ANSUL – A Century Manufacturing

*The ANSUL Centre of Excellence facility in Marinette, Wisconsin.*

After 100 years, we continue to help businesses like yours protect people and property with the ANSUL brand of top performing products.

In 2012, Tyco Fire Protection Products, proud producer of the globally recognised ANSUL brand, celebrated 100 years of industry leadership in commercial fire suppression at the company's Marinette, Wisconsin, USA facility. This is a milestone not many businesses get to celebrate, and we are certainly proud of our team, which has been such a strong force in the industry to keep us thriving in Marinette the past century.

### The ANSUL History

Tyco's Marinette location opened its doors as the Bastol Sales Company in 1912, specialising in producing cattle feed. In 1915, Frank Hood bought the company and renamed it ANSUL to reflect its primary product – a refrigerant chemical – laying the roots for what was to become one of the most recognised fire protection brand name in the world. This spirit of innovation continues today at the 350-acre state-of-the-art Marinette facility, which currently employs nearly 750 people.

ANSUL fire protection products were introduced to the marketplace in 1939 featuring the first cartridge-operated, dry chemical fire extinguisher. As technology changed and dangerous new hazards emerged, ANSUL product engineers worked hand-in-hand with many industries to help them protect their people and property from fire. Today, the ANSUL Fire Technology Centre and Centre of Excellence house one of the most extensive fire research and testing facilities in the world, with scientists and engineers devoting 100 percent of their time preparing for the fire protection and safety needs of the future.

### Solutions Created to Meet Every Fire Protection Challenge

ANSUL special hazard fire protection products are designed and manufactured to strict standards and tested under the scrutiny of national and international independent testing laboratories and approval agencies. ANSUL special hazard fire protection products support a wide range of industries, from data centres, hospitality, marine and offshore to telecommunications.

> **Today, the ANSUL Fire Technology Centre and Centre of Excellence house one of the most extensive fire research and testing facilities in the world, with scientists and engineers devoting 100 percent of their time preparing for the fire protection and safety needs of the future.**

The ANSUL product line includes:

- Hand portable and wheeled fire extinguishers.
- Large self-contained hand-line units.
- Pre-engineered restaurant, vehicle and industrial systems.

# of Quality

- Sophisticated/engineered fire detection/suppression systems.
- Complete line of dry chemical, foam, and gaseous clean agents.
- Hazardous chemical spill control and vapour-mitigating agents.

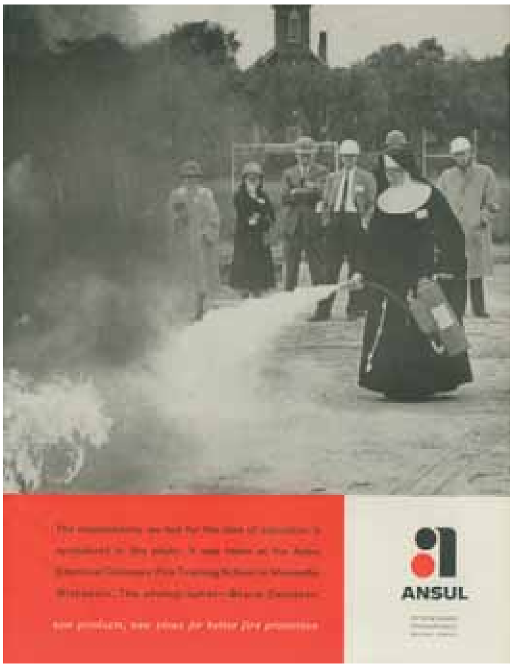
## A Tradition of Training Excellence

Since 1940, the ANSUL Fire School has trained thousands of first responders from high hazard/high risk industries such as aviation, mining, oil and gas, chemical, utility, fire service, and metal processing. In 2006, Tyco opened the new ANSUL Fire Technology Centre housing the ANSUL Fire School and other product training and demonstration facilities. Every year, the ANSUL Fire School trains hundreds of customers from around the world in the basics of hands-on firefighting with portable and stationary fire equipment, using a variety of fire extinguishing agents.

**Authorised ANSUL distributors from all over the world regularly attend intense product training programs where they are instructed and tested in the design, installation and servicing of ANSUL fire suppression equipment. This continually develops an experienced global network of authorised distributors.**

Authorised ANSUL distributors from all over the world regularly attend intense product training programs where they are instructed and tested in the design, installation and servicing of ANSUL fire suppression equipment. This continually develops an experienced global network of authorised distributors that are supported by dedicated field-sales representatives and a professional technical and customer services staff. So you can feel confident that your fire protection equipment will be designed and installed correctly the first time, every time. We also maintain warehouses throughout the United States and in various countries. ANSUL products are never far from your doorstep.

*Lodius Dugas demonstration, Chicago, 1939.*



*An advertisement created in September 1959.*

*"The responsibility we feel for the idea of education is symbolised in this photo . . ."*

## Unrelenting Pursuit of Perfection

In 2010, Tyco opened the Centre of Excellence in Marinette, Wisconsin, USA. Spanning 3,250 square metres within its 151-hectare site on Marinette's Industrial parkway, the research and development facility includes renovation, expansion and integration of existing testing laboratories, training and marketing facilities. The new facility replaces an existing 595 square metre structure built in the 1960s.

"Our Marinette campus is the largest of our global chemical suppression and special hazard operations," said Colleen Repplier, President, Tyco Fire Protection Products. "We have built a century of manufacturing excellence, innovation and world-class fire protection in this community."

## Moving into the Next Century

The ANSUL brand will celebrate its 100th anniversary in 2015. Like the Marinette facility, the brand has stood the test of time. As it moves into its next hundred years, it is committed to developing breakthrough fire protection solutions to help businesses like yours protect their people and property. APF

For more information, go to www.ansul.com

# New flexible Corrosion Resistant Coating

PPG INDUSTRIES has announced the launch of a new application of Pitt-Char XP, a flexible epoxy-based intumescent passive fire protective coating suitable for environments where exterior durability and corrosion resistance are required. It utilises established technologies to prevent steel structures from heating up rapidly in the event of a fire by providing insulative protection against high temperatures.

The product can also be used as an insulative method of protecting structural steel from exposure to the extremely cold temperatures that can result in the event of a cryogenic liquid spill, a feature that is of particular interest to the LNG market. It offers low-temperature flexibility, cryogenic capability, hydrocarbon fire protection, jet fire resistance and blast resistance, and can be used in environments where hydrocarbon pool and jet fires are a risk, particularly under cryogenic and explosion overpressure conditions. PITT-CHAR XP provides enhanced resistance to cracking on flexing and vibrating structures and delays the loss of load-bearing capacity and integrity, buying time for personnel to evacuate to a safe area.

To protect against a hydrocarbon fire, where environmental temperature can increase up to 1,100°C almost immediately, Pitt-Char XP is applied at a thickness of 4mm to 25mm. When exposed to fire, the epoxy coating protects the underlying steel from rapid heating by expanding and forming a ceramic-like layer of char that will be up to six times as thick as the original coating, insulating the steel against high environmental temperatures.

In the case of a cryogenic liquid spill, temperatures can suddenly drop down to –162°C meaning that any insulation system protecting the steel needs to withstand these extremely low temperatures without becoming brittle and failing. The coating is applied in thicknesses ranging from 15mm to 38mm. After exposure to a cryogenic spill, the coating typically remains relatively undamaged and no additional maintenance is required. If a fire ensues, however, the coating will expand at high temperatures and form a protective char.

**For more information, go to www.ppg.com**

# UL Certification for Fluorine-free Foam

The SOLBERG COMPANY has announced that the company has achieved expanded Underwriters Laboratories (UL) certification Listings for the company's Re-Healing foam concentrate. Re-Healing RF3, 3% foam concentrate is a high performance fluorine-free foam concentrate for use on Class B hydrocarbon fuel fires. It is also used to prevent re-ignition of exposed fuels and provides vapour suppression. The expanded UL Listing for RE-HEALING RF3 now includes bladder tanks, proportioners, foam chambers, foam makers and fire sprinklers.

The UL Listing with multiple standard automatic sprinklers includes Reliable F-1 upright and pendent style (5.6 and 8.0 K-Factors), Reliable Model G upright and pendent style (5.6 and 8.0 K-Factors), and the Reliable upright G XLO (11.2 K-Factor). Particularly noteworthy of the expanded product certification for Re-Healing RF3 foam concentrate with these fire sprinklers is the minimum UL Listed sprinkler pressure of 0.5 Bar; the same minimum pressure used for Aqueous Film Forming Foam (AFFF) concentrates.

RF3 foam concentrate is also UL Listed with the Tyco B-1 and Star B-1 sprinkler in both upright and pendent styles, at the minimum sprinkler pressure of 2.0 bar, the same system pressure as used with AFFF foam concentrates. Solberg has also expanded its UL Listings for fire sprinklers with Arctic 3% AFFF and Arctic 3x3 ATC (hydrocarbon and polar solvent fuels). Arctic foam concentrates are 2015 compliant to the U.S. EPA Stewardship Program on C6 fluorine chemistry.

**For more information, go to www.solbergfoam.com**

# Nuclear Decommissioning Authority Approval

ARGON ELECTRONICS has been accepted as a signatory of the Nuclear Decommissioning Authority Supply Chain Charter, which was established to help deliver good working relations and improve planning and performance through all tiers of the supply chain supporting the Nuclear Decommissioning Authority estate.

**For more information, go to www.argonelectronics.com**

# Seeing things globally

The management teams at Angus Fire (UK), National Foam (US) and Eau et Feu (France), the world's leading manufacturers of fire fighting products and technology, have completed a £62 million buyout, backed by mid-market private equity investor LDC, as they look to capitalise on growing global demand for their products within the Oil and Gas, Power, Agriculture, Mining, Military, Aviation, Marine and Fire Fighting sectors.

The new group designs and manufactures fire hoses, industrial hoses, foam concentrates, engineered products and engineered fire fighting systems. These high spec and often mission critical products are supplied to national, international and global organisations in over 150 countries with its largest markets in the Europe, Middle East, Asia Pacific and North American regions.

Angus Fire, which has been established for over 200 years, operates its production facility in Bentham, near Lancaster, and its Angus Fire Engineering team, undertaking fire fighting systems design and project management activities is located in Thame, Oxfordshire, and combined they have over 250 employees.

National Foam, which serves both North and South American markets, manufactures foam concentrates in West Chester, Pennsylvania, both fire and industrial hoses in Angier, North Carolina, and designs large capacity fire fighting monitor systems in Exton, Pennsylvania and has almost 100 employees across all 3 sites.

Eau et Feu, with its production operation based in Reims, France has almost 90 employees, manufacturing fire hoses and foam concentrates for its domestic French fire services, while also exporting its products to French-speaking markets within North Africa and Eastern Europe.

Paul Williams, CEO of the new Business, said: 'LDC's investment provides the financial and strategic support to help us capitalise on the increased demand in emerging markets and the buoyant markets in which we sell our products globally. We look forward to creating a unified proposition and cementing the business' market-leading position through investment in new plant and equipment, together with operational improvements to increase our manufacturing capacity. All this will enable us to serve market demand more effectively.' APF

For further information, go to www.angusfire.co.uk

ANGUS FIRE

NATIONAL FOAM

eau & feu

ANGUS FIRE ENGINEERING

# New Quick Fix & Release Bracket

The new HOLMATRO Quick Fix & Release Bracket does away with the need to devise a solution for securing a hydraulic pump to a rescue vehicle, making pulling out and putting back the pump quicker and easier.

A universal mounting enables the bracket to be fitted to most rescue trucks. It protects the pump from damage during transport, and is reckoned to save valuable vehicle space compared with other securing systems. It reduces strain on rescuers when removing and stowing the pump in higher truck compartments and is currently available for the Homatro Spider range pumps SR 10 and SR 20, for the Greenline battery pump SPU 16 BC and for Personal Power pumps SPU 16 PC and DPU 31 PC.

**For more information, go to www.holmatro.com**

# New LED Flashlight

PELICAN PRODUCTS has introduced the compact and lightweight 3315 LED flashlight, created with first responder in mind.

Requiring only 3 AA batteries, the run-time is nine hours and 45 minutes with a light output of 113 lumens. It provides a beam distance of 153 metres and a peak beam intensity of 5913 candelas. The flashlight's body is engineered to fit perfectly in the natural grasp of a gloved hand and the ridges along the handle ensure a non-slip grip. It features a lockable battery compartment with a tethered door and a castle top so the user can see that the light is on if left standing upright.

The 3315 LED comes in safety yellow or black and is made of virtually indestructible polymer material. A safety wrist lanyard is attached. It has a IPX4 water-resistance rating and measures 156mm and weighs just 0.18 kilograms including batteries.

**For more information, go to www.Pelican.com**

# Double Extrication Tool Holder

ZICO has introduced the Model QM-ETD-1 Quic-Mount double extrication tool holder, an adjustable upright extrication tool mounting solution for two extrication tools. The heavy-duty, aluminium QM-ETD-1 boasts independently adjustable components including tilt angle, enabling it to safely and securely accommodate many popular makes and models of cutter, spreader, and combination tool upright in the compartment.

Mounting to nearly any flat surface, the QM-ETD-1 eliminates the need for custom-fabricated mounting boxes and, whether for new apparatus or replacing the tools on an existing piece of equipment, a double extrication tool holder can be used over and over again with only a few minor adjustments. It is designed Ideal for both hydraulic and battery-powered tools.

**For more information, go to www.ziamatic.com**

# Australian Market Distributor Acquired

PACIFIC SAFETY INTERNATIONAL has announced that it has purchased the shares of both Pacific Helmets (NZ) Ltd and the Australian distribution company, Pac Fire Australia (PTY) Ltd.

According to a statement issued by David Bennett, Executive Chairman and CEO of Pacific Safety International, the discussions to purchase Pac Fire Australia began almost two years ago. Between the two companies, there is almost complete domination of safety helmet sales to emergency services in both Australia and New Zealand and, because it would benefit Pacific Helmets to control the distribution of helmets in both countries, a decision was made to purchase the Pac Fire Australia shares.

Since 2004, Pac Fire has considerably expanded its operations and the range of products sold, and dominates the emergency services supply industry, particularly in Australia. Pac Fire has warehouses in four Australian states, and almost every fire brigade, the State Emergency Service, USAR and paramedic organisation purchases at least one type of helmet from the Pacific range.

A new holding company, Pacific Safety International Ltd (PSI), has been established as the New Zealand holding company, and this company is 100 percent owned by Bennett family interests.

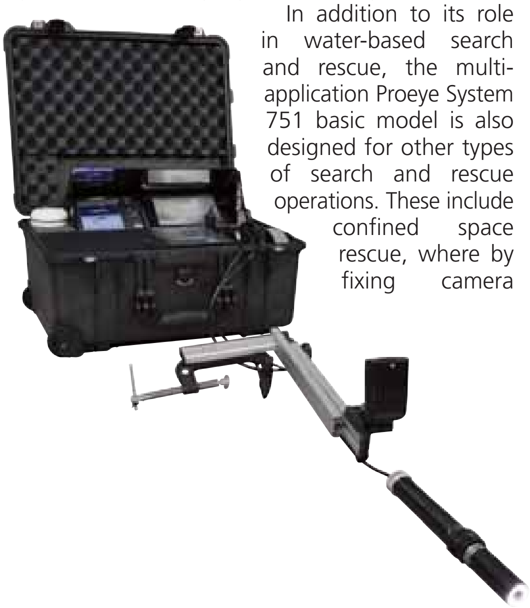
# Water Search and Rescue

In addition to its use during demanding land-based urban search and rescue activities, the light and ruggedly designed Proeye System 751-SNR Sonar Plus multi-purpose search camera system from the Yone Corporation can also be used for under water operations.

The unique Proeye System 751-SNR enables operators to see sonar images and real-life images at the same time that are captured by the underwater camera's head. Such is the sophistication of the 751 that clear images can be seen even when searching the dark or cloudy waters of lakes, dams and rivers.

Thanks to the side imaging and down imaging technologies incorporated into the 751-SNR's sonar system, rescue personnel in a boat are able to safely and rapidly locate and visualise targets such as sunken boats, vehicles and accident victims, often in a matter of minutes. The remotely controlled underwater camera head has 270° articulation and is designed for depths of up to 50 metres. It can be placed directly into water or, optionally, by attaching it to the telescoping rod. An integral GPS system indicates the exact location on the system's sonar display.

The system is powered by a rechargeable 12-volt rechargeable battery that provides an operating time of between one-an-a-half hours and two hours. As standard, the camera comes with a ten-metre cable, and the 751-SNR is housed in the control box, which measures 560mm by 455mm by 265mm and weighs just 14.5 kilograms.



In addition to its role in water-based search and rescue, the multi-application Proeye System 751 basic model is also designed for other types of search and rescue operations. These include confined space rescue, where by fixing camera head to the optionally-available telescopic rod, rescue personnel can be helped to locate entrapped victims. For rescue operations requiring audio, the small microphone of the optional Proear audio system can be attached to the camera head.

When carrying out airborne rescue operations, the camera head can be suspended from a helicopter, allowing on-board rescue personnel to receive a clear image of inaccessible locations under water. In these cases, an optional 20-metre extension cable with water proof connector can prove helpful.

The Yone Corporation is headquartered in Kyoto, Japan and manufactures and markets a broad range of firefighting, disaster prevention and search and rescue equipment. APF

For more information, go to
www.yone-co.co.jp

# New NFPA Standard for PPE

All firefighter structural PPE manufactured to the NFPA standard is now required to meet NFPA1971:2013, which incorporates a number of changes, the most noticeable of which is difference will be in the appearance of fire coats. These will now have reinforcements beneath reflective trim on sleeves, or other design changes, to dissipate the stored energy effects of moderate radiant environments.

To meet the revised standard, BRISTOL UNIFORMS is introducing two new NFPA ensembles based on both the Ergotech Action and XFlex designs. Both new designs will dispense with the use of arashield reinforcements on sleeves and shoulders as well as perforated trim. Fire coats will now have a 76mm wide Neoprene strip placed under the outer-shell at the sleeve reflective position. Only 75mm Triple Trim will be used on coats and trousers.

Although primarily used in North America, the NFPA standard is important globally as it is used extensively in parts of the Asia Pacific region both by municipal fire authorities and companies in the oil and gas industries.

**For more information, go to www.bristoluniforms.co.uk**

# Vertical Ventilation & Suppression Online Training

UL FIREFIGHTER SAFETY RESEARCH INSTITUTE (UL FSRI) has launched "*Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes*" – an online course that serves as a culmination of the work performed under the 2010 Department of Homeland Security Assistance to Firefighter Grant Program.

The interactive training walks learners through the research approach, experimental setup, test results, and tactical considerations derived from the test results. This course supplements the project's technical report through fire service commentary on the impact UL research has on firefighting tactics, interactive fire scenarios, video from all 17 full-scale residential structure fires, and numerous photos.

Three separate paths are available – abbreviated, complete, and instructor – ranging in duration from one hour to more than two hours. An overview of modern fire challenges facing the fire service provides a summary of factors impacting fire dynamics – increased fuel loads, large open spaces and lightweight construction. To enhance the educational experience, an introduction to the key concepts of heat release rate, flow paths, and stages of fire development is included. The twelve tactical considerations developed from the research results are illustrated to aid the fire service with integration into their education and fire ground tactics where applicable.

Students have the opportunity to use interactive models to develop an in-depth understanding of the impact of ventilation and water application on fire dynamics. Instructors are provided with links to related research material to aid in tailoring the research results to specific fire service operations. The course is compatible with tablet devices and iPad via the Articulate Media Player application in the App Store.

**For more information, go to www.ULfirefightersafety.com**

# Beam Smoke Detector Upgrade

FIRE FIGHTING ENTERPRISES has upgraded its Fireray 5000 optical beam smoke detector with separate fire and fault relays for two detector heads attached to a single controller unit. This means that one ground-level unit can control two detector heads but any alarm or fault signal will be located to each specific head. An event device history log has also been added, and power consumption has been reduced even lower than on the original model.

Having two detector heads on one controller allows even larger spaces to be covered from a single control unit. Separate fire/fault relays have been added for each detector head, which will enable addressable systems to identify which of the detector heads has been triggered. The separate heads are independently configurable, with separate range, alert threshold and delay settings possible.

This upgrade is fully backwards-compatible with existing systems, and the new event history log stores up to 50 detector events such as alarms, servicing and power status changes.

**For more information, go to www.ffeuk.com**

# Chemical Warfare Detector Simulation

CBRN simulation systems manufacturer, ARGON ELECTRONICS, has been awarded worldwide exclusive rights by Bruker Daltronic to develop and manufacture a training simulator for the Bruker RAID-M100 chemical detector. The simulator will enable RAID-M100 users to experience the features of this highly regarded detector, including its ability to specifically identify detected substances. RAID-M100-SIM will be capable of operation on a standalone basis, or with Argons' PlumeSIM instrumented CBRN simulation system.

**For more information, go to www.argonelectronics.com**

# FIRE MAX 3 –

## next generation protection

- 20 years of Rosenbauer personal protection equipment.
- The FIRE MAX 3 with an entirely new material structure.

Rosenbauer initiated its production of personal protection equipment more than twenty years ago in the autumn of 1992 with the launch of the Heros fire service helmet. The company thus advanced from the status of a retailer to a producer and, since then, has systematically expanded its own equipment portfolio.

In particular, the FIRE MAX 3 meets the strictest safety requirements, as well as all relevant norms, and is also a fashionable trendsetter when it comes to design and comfort. The suit combines all the benefits and advantages of its predecessor, the Fire Max II. However, it also achieves still higher protection and, owing to the very latest cut and finishing, provides a level of wearer comfort previously unattained in a fire service turnout suit, which is maintained even in the most extreme operational situations.

### Highest Protection Levels

The FIRE MAX 3 has both EN 469:2005+A1: 2006 (including Annex B) and EN 1149-5:2008 certification, whereby it achieves the highest protection levels in all categories.

- **Heat Permeation**
  In an emergency, a turnout suit must provide reliable protection against both flames and heat radiation for long enough to allow the wearer to withdraw from the danger area. The European EN 469 standard stipulates parameters, which are clearly surpassed by FIRE MAX 3.
- **Burning Behaviour**
  Naturally enough, resistance in relation to flaming, burning behaviour and flame spread is particularly important and the FIRE MAX 3 passed trials in this regard with flying colours. During such testing, various material samples are subjected to temperatures of around 1,000°C (84 kW/m$^2$) on both the inside and outside for ten seconds. The FIRE MAX 3 has values clearly below the maximum of two seconds demanded by EN 469:2005. The seams stay tightly closed and sealing elements remain fully functional.
- **Water impermeability & water vapour penetration resistance**
  Fire services require protective clothing that is impermeable, not only against external moisture, but also the penetration of liquids such as petrol and extinguishing water. EN 469 prescribes water-tightness of at least 20,000mm water column, while the FIRE MAX 3 is characterised by a value of 100,000. A moisture blocker also provides the appropriate protection against cold. All benefits are achieved by means of a breathable, highly heat-resistant PTFE membrane, which has pores that are small enough to prevent water droplets entering, but large enough to allow water vapour molecules to escape. The FIRE MAX 3 corresponds with the highest performance level in every category of the EN 469 standard.

### Innovative Materials & Fabric Structure

- **Heat-Resistant Outer Fabric**
  Either Nomex Tough, which is the classic fibre employed for fire service protective clothing, or high-performance polybenzimidazole (PBI) are used for the outer fabric. Both are extremely heat-resistant, flameproof and possess excellent mechanical and care characteristics.
- **High-tech Climatic Membrane**
  In the FIRE MAX 3, Rosenbauer employs a new PTFE membrane laminated onto a basophil fleece substrate as a high-tech moisture protection layer or liner between the outer fabric and the lining. The membrane has fine pores, which allow water vapour to pass, but not water in liquid form. Consequently, evaporated perspiration can be rapidly transported out of the suit and this results in a marked temperature difference between the inside of the jacket and the surrounding area. Not least, the lining is characterised by pleasant wearer comfort and low weight.

### Characteristics & Functional Details

The new Rosenbauer turnout suit is waterproof, windproof, breathable and thermo-regulative; that is, warming or cooling on the skin.

### In Use Worldwide

Fire Max turnout suits are in use across the globe and the strict safety standards contained in EN 469 are recognised in the majority of countries. As a consequence, like in Germany, Austria and Switzerland, firefighters in Australia, South America and the Near East have also placed their trust in the advantages of Rosenbauer products. Indeed, Rosenbauer provides a complete selection of personal protection equipment consisting of Heros helmets, Fire Max turnout suits, Safe Grip operational gloves and Twister, Twister-cross, Tornado and Austria boots. APF

For more information, go to
www.rosenbauer.com

# NZ Revises Sprinklers Standard

The New Zealand standard for automatic fire sprinklers, NZS 4541:2007, has undergone a limited technical review and has now been published by Standards New Zealand as NZS 4541:2013 Automatic fire sprinklers.

**Jayne McCullum**

Standards New Zealand

NZS 4541 (Automatic fire sprinkler systems) covers the design, installation, and maintenance of sprinkler systems so that systems reliably achieve their fire control functions – that the fire should be controlled within a specified area and that control should be achieved before levels of toxic by-products of combustion become life threatening. NZS 4541 is referenced in the Fire Safety and Evacuation of Buildings Regulations 2006, the Building Regulations 1992, and in Clause C *Protection from Fire* and Clause F7 *Warning Systems* of the Compliance Documents to the New Zealand Building Code, and is used extensively across the fire protection industry.

The significant changes to the standard include the following:

### 1 Storage Occupancies

Part 9 of the standard has been significantly revised to reflect the latest full-scale fire research and testing for storage occupancies. The development of technology to reflect the latest fire testing and research has led to superior fire suppression characteristics. This has resulted in more cost effective sprinkler systems, by minimising the need for in-rack sprinkler heads in most applications. Additional cost savings will be possible due to reduced water storage volume requirements.

### 2 Learnings from the Canterbury Earthquakes

The adequacy of the provisions for seismic resilience of the existing sprinkler standard was studied following the September 2010 and February 2011 Canterbury earthquakes. The revised standard has reinforced the need to meet the seismic provisions of the New Zealand Building Code for water storage tanks. The benefit is that there will be greater surety that the sprinkler system can be relied on to function should a fire occur following an earthquake.

The revised standard also reminds users to take into account the need to ensure that the sprinkler system and ceilings are designed to account for earthquakes.

### 2 Routine Testing, Maintenance and Inspection Requirements

The committee had a number of concerns with maintenance practices in the field – it was clear NZS 4541:2007 was often not being followed and some omissions were potentially critical. This has resulted in a number of changes to the provisions for testing, maintaining, and inspecting sprinkler systems. There is now a clear signal that there will be a greater scrutiny on compliance and more detailed guidance has been provided, with emphasis on having the correct supporting documentation.

In addition, some changes reflect the pragmatism of carrying out some of the previously specified requirements. While the majority of changes are relatively minor in nature, they are significantly important in terms of correct sprinkler system operation in the event of fire.

### 4 Sprinkler Protection in Certain Small Buildings Used Only for Community Purposes

This edition of the standard introduces the ability to reduce the cost of sprinkler systems for certain small buildings such as churches, marae (communal or sacred places), sports clubs, and simple buildings owned or used for community purposes.

The cost reduction will come at the price of reduced reliability. On that basis, the reduced standard will only be suitable for buildings not requiring a sprinkler system for New Zealand Building Code compliance.

It is anticipated that this change will ensure a greater number of buildings used for community, cultural, religious, or heritage purposes that would not normally be sprinkler protected, are protected.

### 5 Minor Items

Many small amendments have been made to the standard to reflect experiences and issues reported by users of the standard, including formal interpretations published by Standards New Zealand's Fixed Fire Protection Group.

It is intended that the supporting documents to the New Zealand Building Code and the Fire Safety and Evacuation of Buildings Regulations will reference this edition of the standard, NZS 4541:2013, as a means of compliance. This is subject to:

- Publication of an amendment to the supporting documents to the NZBC Clause C *Protection from Fire.*
- An amendment to the Fire Safety and Evacuation of Buildings Regulations. **APF**

**Jayne McCullum** is Senior Advisor, Corporate Marketing and Communications at Standards New Zealand

For more information, go to www.standards.co.nz

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# Smoke, Heat and Flame Detection

## – Choosing the Best

**Warren Moyle**

Apollo Fire Detectors

The vast array of fire detection system options can baffle even the most technically-minded of people. To avoid being confused by this increasingly sophisticated array of evolving technology, there are some factors that installers and specifiers should consider to help ensure that the right system choices are made.

### Where will the System be Operating?

Understanding how fire detection systems work is crucial to selecting the right product. Although this sounds simple, it is important to remember an alarm system's overall objective – to save lives and protect property. In order to obtain the most reliable protection, the type of fire detector must be considered in relation to the environment in which it will be used.

There can be great variation in the environments that need protecting. For example, an industrial workplace may contain a furnace, kiln or oven that will cause a dramatic temperature variation when opened. A loading bay may be subject to high transient levels of exhaust fumes that could be mistaken for smoke. It is therefore crucial that suitable smoke and heat detection is matched to the requirements of each individual application.

### The Best Protocol

Before choosing the best technology for a fire detection system, specifiers and installers must first decide on their choice of protocol. Protocol is the 'language' that is used by intelligent fire detection devices to communicate with each other. Some manufacturers do not disclose the nature of their protocol to anyone else because they offer a complete system; the protocol is therefore said to be 'closed'. Others, like Apollo Fire Detectors, publish and share their protocol with their panel partners to design and develop compatible products. This is referred to as 'open' protocol.

By choosing a closed protocol system, users are committing themselves to one single manufacturer for the lifetime of the system. It is therefore worth checking whether this commitment comes with any advantages for the user, and if the manufacturer is a well-established company. Checking for how long the product range will be supported is integral to avoiding costly maintenance or replacement in later years. It could even involve premature replacement of the entire system if it becomes obsolete before the end of its design life.

An open protocol system is supported by a number of manufacturers and therefore avoids many of these potential pitfalls. If one manufacturer is unable to support the system, compatible products and maintenance support will still be available from others using the same protocol. An open protocol system is therefore also likely to offer greater choice, meaning that the upgrading or replacing of products is easier.

### Which Product or Technology is Best?

The next question that specifiers and installers need to consider is which technology should be chosen, and how it can be applied to best effect. The types of fire that can occur can range from slow, smouldering fires to rapidly flaming fires with little smoke. Manufacturers have developed detectors that are capable of detecting all of these different fire types. Some of the most common types of detection products include:

- **Optical (photo-electric) Smoke Detectors**
  These are suitable for a wide range of smoke types symptomatic of early stages of fire. They respond particularly well to slow-burning, smouldering fires. These detectors use a proven technology, are insect-immune and offer improved designs for airflow and drift compensation.
- **Heat Detectors**
  These use a reliable and inexpensive technology and are ideally suited for areas such as kitchens, laundry rooms and boiler rooms.
- **Multi-sensor Detectors**
  These offer a combination of smoke and heat sensors and, for their sheer flexibility, are the best general-purpose detectors currently

available. They combine optical readings with temperature change to give a rapid response to the widest range of fires of any detector type, dramatically improving rejection of unwanted alarms.

- **Ionisation Smoke Detectors**
  These are good specialist detectors, which respond well to fast-burning (flaming) fires and are now used to overcome specialist problems.
- **Carbon Monoxide (CO) Detectors**
  These provide good early warning of deep-seated, smouldering fires and are unaffected by common sources of unwanted alarms such as steam, cooking or dust. However, CO detection should only be used as an adjunct to general purpose smoke detectors, never as a substitute.

Fire detectors have also been developed to combat the risks that are specific to certain applications. These include:

- **Optical Beam Detectors**
  The infrared transmitter and receiver are housed in separate devices so that a light beam can be sent and received across large voids – such as warehouses and church halls. If smoke obscures the beam, less light will be measured by the receiver and the alarm will be triggered.
- **Flame Detectors**
  These detect either ultraviolet (UV) or infra-red (IR) radiation emitted by fire. They can even detect gas fires that are invisible to the naked eye. They are effective in protecting areas where open flaming fires may be expected, such as oil refineries, power plants and car factories.
- **Duct Detectors**
  These provide early detection of smoke in the air moving through heating and ventilation (HVAC) ducts in commercial and industrial premises.

A number of detectors are also available that have been designed with the needs of specific industries in mind. Examples include intrinsically safe (IS) detectors, which are versions of optical and heat detectors specifically designed to protect areas where explosive mixtures of gas and vapour may be present. Environments where IS equipment may be required include chemical engineering plants, offshore facilities and marine vessels. Detectors are also available that have been designed for use in marine applications. These operate in the same way as standard devices, but are subject to additional approval tests specific to the marine environment. The marine and offshore industries are also starting to shift towards specifying Safety Integrity Level (SIL) approved products. Although not a legislative requirement, consultants will often specify SIL approved equipment as SIL is a measure of safety system performance, or probability of failure on demand.

## Minimising False Alarms

Ensuring that the right technology is chosen for the right environment can help reduce occurrences of false alarms. A false alarm is an alarm raised by the fire detection system that turns out not to have been triggered by a genuine fire. These alarms can be caused by a number of factors including malicious interference, poor system design, poor or non-existent maintenance and a change of use without a corresponding review of fire requirements – all issues that can often be tackled by giving systems the correct forethought at the point of purchase.

Some manufacturers offer products that have different sensitivity settings so that fire detectors can be 'fine-tuned' to the local environment. The Discovery range from Apollo is one example, which, importantly, has been certified in each of its five different operating modes. The five different modes are designed to take account of the variations in fire detection requirements, as, for example, the requirements of a clean manufacturing facility will be very different from that of an industrial boiler room.

## Maintenance Considerations

Like any other essential plant, a fire detection system also needs to be regularly tested and reviewed to ensure its ongoing effectiveness. Even the best-installed and best-in-class equipment deteriorates over time, so once installed, a fire detection system needs to be regularly tested and reviewed. A service and maintenance agreement that extends over the overall life expectancy of the equipment will minimise the risk and likelihood of fire detection failure and should be budgeted for to obtain best value.

Many of today's detectors have built-in drift compensation, which makes allowances for the accumulation of dirt and dust between regular checks. However, this does not negate the need for planned maintenance, without which even the best fire system will be rendered useless. Re-assessments should also always be undertaken for any change in a building's use or layout as this may require repositioning of existing fire detectors, or even changing the type of detector used.

## Replacing Systems

Until now, manufacturers have only made limited information available about the expected lifetime of a fire detection product. This lack of information can make the budgeting and financing of a facility's fire detection system very difficult. It is definitely worth asking about the warranty that is provided by the manufacturer, as well as checking whether any onerous conditions are attached. A crucial question to address is, if a product is faulty or fails prematurely, who is liable for the cost of replacement?

Recognising the importance of guaranteeing products for their recommended working life, Apollo has developed a Product Lifetime Guarantee to this effect. All our fire detection products are covered for ten years, with the exception of CO detectors which are covered for five years – the average lifetime of these products.

## Conclusion

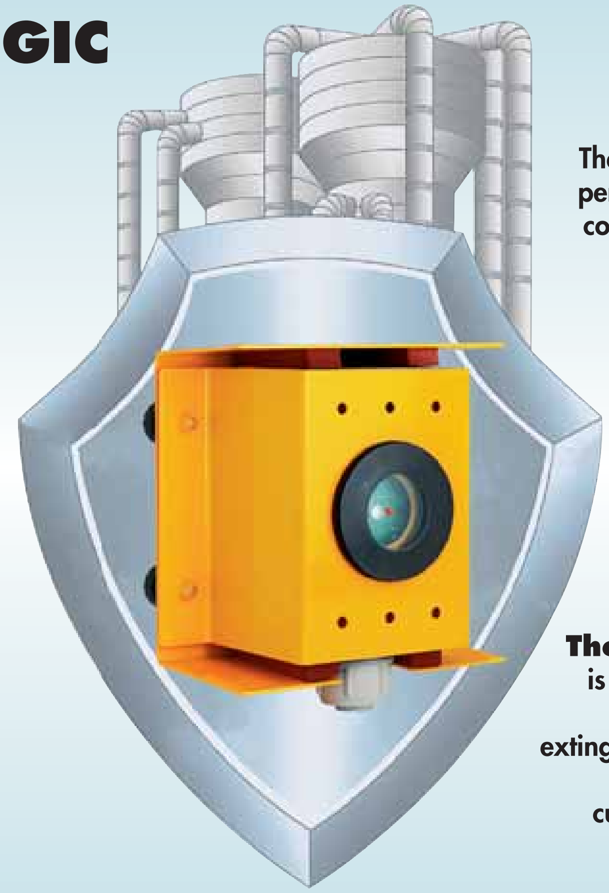
Fire detection is a complex business with many factors to consider when choosing the correct system. New technology and changes in legislation mean that even those specifiers and installers with considerable experience have to consider the most appropriate technology for each application. An understanding of the environment within which the detector will operate, knowledge of the best type of detector for those conditions, an awareness of the implications of open or closed protocol systems, and manufacturer warranties are all crucial factors in making the right decision. **APF**

**Warren Moyle** is Senior Product Support Engineer at Apollo Fire Detectors

For more information, go to www.apollo-fire.co.uk

# CONTROL LOGIC
# Spark detector

designed for dust collection systems to protect storage silos from the risk of fire.



## Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds

**The CONTROL LOGIC SPARK DETECTOR** is faster than the sparks themselves. It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash. It needs no periodic inspection.

**The CONTROL LOGIC system** is designed for “total supervision”. It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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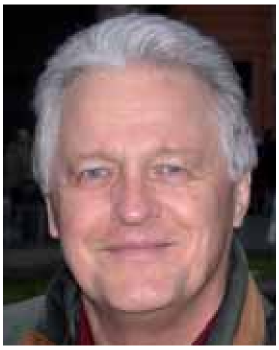
*This particular SRV comes with 60 metres of hose, a fixed position reel and a fog gun with infinite adjustment from full spray to jet*

# First Response, Rapid Intervention



**Graham Collins**

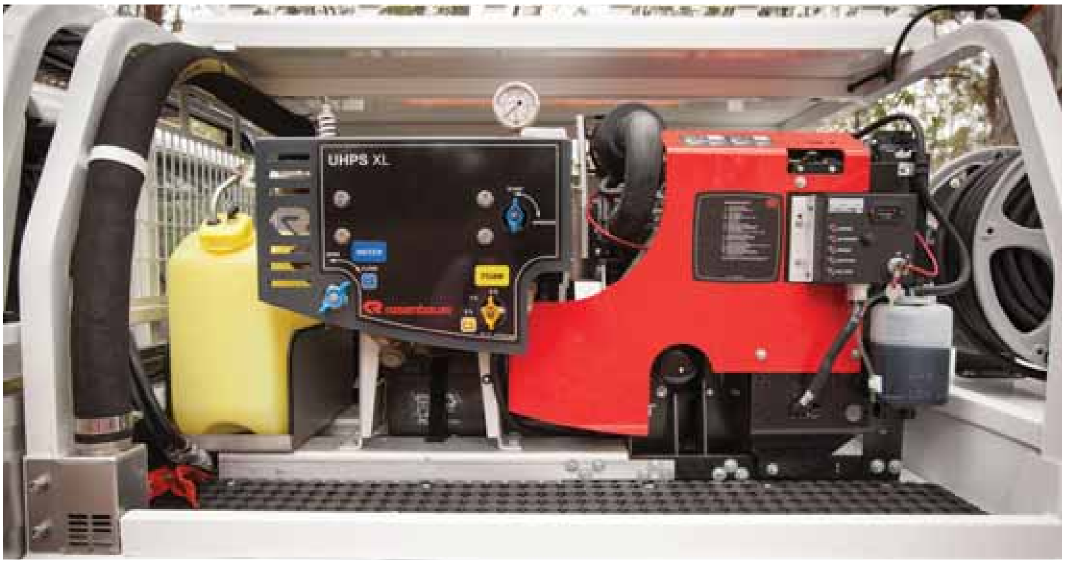
While it is the monster-looking, stainless-steel encrusted firefighting appliances that are undoubtedly the most spectacular and awe inspiring, they are not necessarily the most cost effective solution for every firefighting role. With brigade budgets across the Asia Pacific region and – in some countries – even manning levels being slid under the number-cruncher's microscope, many are now looking at small vehicle options that can respond faster to some incidents at a lower cost, and with greater resource efficiency.

The development of this type of specialist vehicle has undoubtedly been driven by the need for speed, mobility and economy; to get to the scene of the fire in the shortest possible time, and not be hindered in this endeavour by size or access limitations. They enable first response and rapid intervention in a variety of applications including bushfires, aviation fires and mine fires and emergencies. They also come into their own in congested environments in some of Asia Pacific's older, congested and densely crowded cities, where getting a small vehicle to the scene of, say, a vehicle fire is about the only option to otherwise allowing the fire to engulf an entire district. These units are also an effective solution for specific fire risk environments as diverse as motor racing and country shows.

Motor racing venues, for example, exemplify the difficulties of providing fire protection across large, complex sites. Typically, racing circuits comprise a mixture of vast, sweeping open spaces alongside tight, confined areas such as the pit lanes and garages; environments where a combination of flammable materials, fuel and power sources can easily lead to a fire breaking out. In such highly charged environments, these smaller fast-reaction vehicles carrying a limited amount of suppression or extinguishing agent offer speed, mobility and the ability to access tighter spaces. They can be utilised to completely extinguish a fire, or at least contain it until heavier and slower front-line firefighting vehicles arrive to complete the extinguishing.

They can get professional eyes at the scene of an emergency in the shortest possible time to assess the manpower and resources needed. This means that the fire and rescue service's front-line fire appliances need no longer be tied up attending non-critical small fires, freeing them up to be available to attend life-risking or major property-risking incidents.

These vehicles are known under a number of different names, with SRV or Small Rescue Vehicle being the most common (in some countries they are better known as MERVs or Mini Emergency Response Vehicles or EUVs – Emergency Utility Vehicles). While some are little more than a utility vehicle or an open top pick-up truck with firefighting or rescue equipment loaded on board, the latest and more sophisticated models are carefully designed and ingeniously engineered that are bringing about a major re-think in many fire and rescue services. Many of these SRVs now offer manoeuvrability on-road and off-road across extreme terrains, and carry powerful mobile extinguishing technology including ultra-high pressure



*A Rosenbauer UHPS diesel-powered extinguishing system delivers 38 litres-a-minute at 100 bar.*

systems (UHPS) and compressed air foams systems (CAFS).

Take, for example, a new SRV developed jointly by Australian company, Sasgar Fire & Rescue, and Minecorp – a leading Australian mine vehicle safety equipment manufacturer – that was given its first public showing at the AFAC/Bushfire CRC Conference in Melbourne in September.

It differs from many other units on the market by being a purpose-designed solution built on a long-lifetime 3.2-litre, six-cylinder, single cab Ford Ranger chassis that offers a high degree of operational and application quick-change, swap-out versatility. It is also built to exacting standards. The lightweight all-alloy construction Sasgar SRV has the highest ANCAP (Australasian New Car Assessment Program) 5-Star rating and satisfies all ADR (Australian Design Rules) and GVM (Gross Vehicle Weight) weight regulations.

The guiding principle of the Sasgar design is to ensure that the firefighter has the right tool for the job at hand, so a key feature of the body

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design is the ability to change the firefighting or rescue modules in the shortest possible time. This is achieved through the incorporation of fork-lift lifting points in a base tray that are accessible from both sides of the vehicle. This, combined with a patented quick release mounting and locking system means that the skid removal swop-over time is drastically reduced, as is the need for manual handling. Nylon guides facilitate easy location of different modules onto the tray or skid, reducing wear, lowering maintenance costs and extending the life of the modules and the tray.

As standard, this particular SRV incorporates a large lockable or optional central locking toolbox for medium-sized accessory storage that features dust and water seals and internal LED lighting. A second low-profile box is also included for the storage of smaller accessories. This too has dust and water seals and internal LED lighting. Another feature is an overhead storage tray for wet or dirty items that incorporates tie-down points for ropes or a cargo net. Storage of long pieces of equipment, such as a fire rake or shovel, is incorporated under the tray.

Directionally-adjustable, high-level front and rear LED work-lights are mounted on the SRV, with the two rear lights connected to the vehicle's reverse switch.

In terms of the firefighting system, the model on show at the AFAC/Bushfire CRC Conference – which was the company's prototype model – incorporated a Rosenbauer UHPS (Ultra High Pressure System) diesel-powered extinguishing system that delivers 38 litres-a-minute at 100 bar and an integrated foam proportioning system that offers one percent, three percent or six percent continuous proportioning and, depending on the final specification, 20 litres to 40 litres of foam. A CAFS (Compressed Air Foam System) is also available.

The particular SRV comes with 60 metres of light, kink-free and abrasion-resistant DN12 hose, a fixed position reel with an isolation valve, and an ergonomically designed fog gun with piston handgrip and infinite adjustment from full spray to jet. There is a custom built 200-litre to 300-litre – again depending on the final specification – ball baffle system water tank, and a manually-regulated quick fill inlet that is available in all coupling systems, plus an optional second hose reel and optional electronic rewind reels are available.

*A quick release mounting and locking system means that, on the Sasgar SRV, skid removal swap-over time is drastically reduced.*

With what seems to be the ever more demanding tasks emergency services are called upon to perform, the Small Rescue Vehicle has much to commend it, and it seems likely that they will be increasingly found in the arsenal of municipal fire and rescue services and industrial firefighting teams. The versatility of the more sophisticated and adaptable units is undeniable and it seems inevitable that, in the coming years, they will be more frequently utilised providing tactical emergency support, in the speedy rescue of trapped confined space victims, and supporting water rescue, rope rescue and urban search and rescue operations. APF

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*An Angus LNG Turbex applies Expandol high-expansion foam despite the searing heat of LNG fire*

# Are We Adequately Protecting Our LNG Facilities?

We have seen a massive investment in new Liquefied Natural Gas (LNG) facilities over the past decade to provide a cleaner fossil fuel than the more traditional diesel and oil used for power generation, heating and commercial transportation. A substantial amount of that infrastructural development and investment is still being undertaken, particularly in Australia, the broader Asia-Pacific region, Africa, Russia, India and some parts of the Americas.

**Mike Willson**

Angus Fire

But in an industry with an exemplary safety record and very few incidents, are our fire protection systems proven to work in a real LNG fire scenario? Will they respond quickly enough to protect personnel and avoid facility damage? Is there a danger that LNG is being confused with the more widespread and familiar fire protection needs of Liquefied Petroleum Gases (LPG) like propane and butane, where water sprays predominate over firefighting foam applications? Let us investigate the extensive research that helps provide some answers.

## What is LNG?

Natural gas is 83 percent to 99 percent methane, which reduces its volume 620 times when refrigerated to its liquefied state. This makes it attractive for transporting across continents, where no pipelines exist. LNG is stored at around minus 164°C, is colourless, odourless and flammable in

*LNG ignition on 45m$^2$ pit with flames 30 metres high, which dramatically lose intensity, being reduced to about 1 metre high, when an effective Expandol foam blanket has been produced by the LNG Turbex foam generator skids*

air over a broad range, between five percent and 14 percent concentration.

## How does LNG behave?

LNG looks just like boiling water in a kettle when it escapes from its containment tanks or pipework, and is heavier than air when released, quickly absorbing heat from its surroundings and creating a white vapour cloud, a fog of condensing water vapour from the rapidly cooling air that mixes with the vapour. Controlled warming can reduce LNG vapour density so it becomes lighter than air and rises away from ignition sources, but flammable concentrations are generally detected outside the white cloud drifting downwind from the release point, where a liquid pool soon develops.

Firefighters need to stay well away from the white cloud, which is often very cold and masks the cryogenic liquid pool beneath. LNG liquid is cold enough to crack structural steel, freeze and shatter most rubbers, conventional concrete, even gloved fingers if exposed to the liquid pool, or dense cloud hovering immediately above it.

Some people assume with such a huge temperature differential that any escaping LNG will quickly flash off and not develop into a pool, but quite soon after initial rapid vaporisation has stripped all the heat from the ground and immediate surroundings, a liquid pool will form and grow if the spill continues. Meanwhile the condensing water vapour cloud mixed with the methane is spreading downwind, and beyond its edges forms a flammable mixture that ignition sources can dramatically ignite. Burning back through the vapour cloud to the liquid pool rapidly increases radiation levels from the clean burning fuel without smoke to absorb heat. The intensity is typically three-times greater than an equivalent sized gasoline pool fire. Structural steel downwind can quickly weaken and intended escape routes may become inoperable from the intense radiated heat. Trenches and impounding basins are often designed into the facility to collect any LNG spill, but what is the best way to reduce the risk of vapour ignition, and minimise the radiant heat from the pool, should ignition occur?

## Why is LNG Vapour Dispersion Important?

While LNG carriers often use water spray systems to flush any spillage off the ship to avoid cracking the hull, then steaming away to leave the incident behind, this is not a practical option for land-based or tethered floating LNG production facilities. Water alone contains too much heat, increasing vaporisation rates and rapidly increasing the size of the vapour cloud drifting downwind.

Extensive research conducted at Texas A&M

University's Engineering Extension Service world-class LNG fire training facility with BP and Angus Fire, re-visited many options to determine the best vapour dispersion and fire protection answers for modern LNG facilities. Water, low-expansion foam and compressed air foam systems were quickly dismissed as they contain too much water, which boils the LNG too quickly increasing vaporisation rates without providing adequate vapour dispersion, or fire control. Yet high-expansion foam delivered through high performance LNG Turbex Skids and Expandol three percent high-expansion foam concentrate at an application rate of 10 Litres/square metre/minute (L/m$^2$/min) delivered the necessary speed of response and control being sought.

High expansion foam contains sufficiently small amounts of water to quickly and dramatically reduce the rate of vaporisation when an un-ignited LNG spill occurs, and provides just enough warming to allow the vapours to rise steeply away from potential ignition sources near the ground, significantly reducing the risk of ignition.

Water sprays can be helpful providing a water curtain to prevent LNG vapours reaching sensitive areas, but they need to be ground mounted and produce an overlapping full 180° spray pattern like the gunmetal Hydroshield unit, but care must be taken to ensure the resulting water does not drain into the LNG pool, as it could rapidly increase vaporisation rates, potentially escalating the incident.

## Why Control Rather than Extinguish an LNG Fire?

Should ignition occur, vapour burns back to the liquid pool where radiant heat levels increase dramatically. Applying water or low-expansion foam adds too much heat simply intensifying radiation levels further. Dry chemical powder can extinguish small LNG pool fires, but unlike most flammable liquids, extinguishing LNG fires is not the preferred option, otherwise more un-ignited vapours spread out to find another ignition source, causing unexpected potential danger to personnel and facilities while recovering from the incident, and what do you do with the remaining LNG pool?

It is generally better to know where the fire is, and research showed that a controlled burn-off through a 500:1 high-expansion foam blanket dramatically reduced radiation levels from the LNG pool fire by 90 percent within 60 seconds of system activation. Regular top-up with foam maintained this radiation reduction until the LNG fuel burnt away.

Tests conducted with medium-expansion foam had varying success. Around 50-100:1 contained too much water and provided inadequate fire control, while expansions around 300-350:1 proved effective, but would add cost to any system compared to 500:1 in terms of extra generators, and larger quantities of foam concentrate and water demands for a given protection area, so it was only considered of significant value for protecting narrow trenches or very windy sites.

## What Makes a Good System?

Uniform bubble size and stable foam blankets were found to be most effective when formed using forced air technology generators, where a water-driven turbine and fan assembly forced con-

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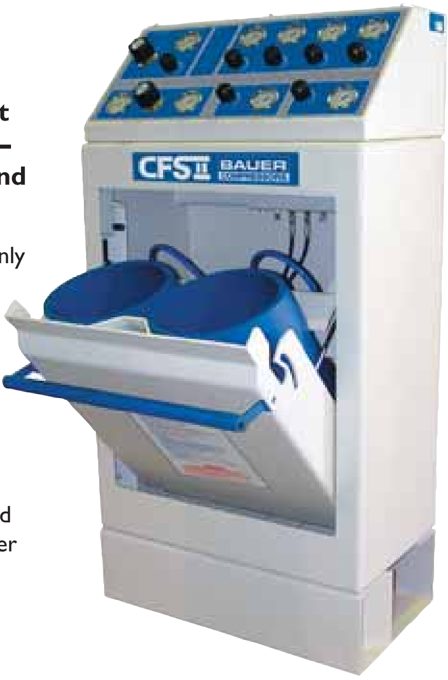

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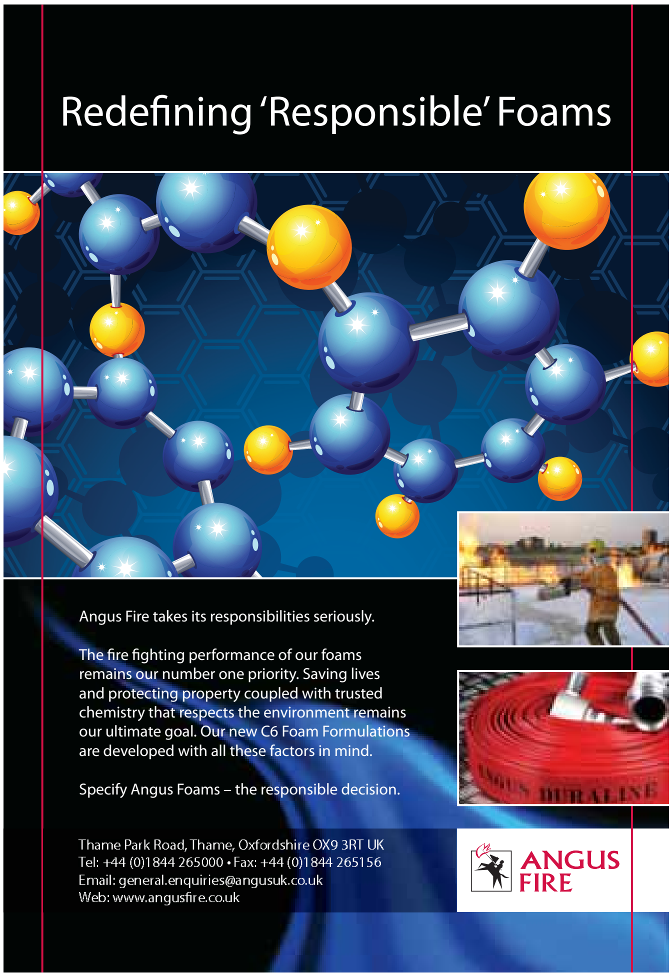
trolled amounts of air into the foam solution each minute to create a more stable and uniform foam bubble blanket, irrespective of wind conditions.

These LNG fixed Turbex skid units with wind protective hoods are specially designed to withstand the rigors of these extreme cold and hot applications. Special drainage slots take the initial foam solution away from the LNG pool and deliver it outside the pit, reducing unnecessary heat inputs before the high-expansion foam blanket is established. Special boiler-grade 316 stainless steel and gunmetal components need to be used that resist inter-granular corrosion and the adverse effects of saline coastal environments, while retaining strength even during prolonged flame exposure during operation. Glass rope insulation minimises the risk of the foam solution boiling in the turbine assembly. These units were proven time and again under severe fire conditions and worked reliably every time.

It quickly became clear that any standard high expansion fan driven generators for industrial applications, made from mild steel perhaps with some plastic, fabric netting or aluminium components, would be totally unsuitable for LNG applications. Similarly "spray on net" foam generating devices are easily starved of air by cross winds. This dramatically reduces expansion ratios, causing more water to enter the pit and furiously boil the LNG. Consequently these "spray on net" devices are usually not up to the job either, yet they both exist beside LNG containment pits and should be replaced with some urgency, before they fail to adequately control an LNG incident.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Separate high temperature fire tests were conducted to verify that these standard industrial units quickly distorted, lost strength, components melted or locked up with heat expansion, and consequently failed to produce high-expansion foam, rendering them practically useless for LNG duty.

The choice of foam concentrate was also important as some high-expansion foam concentrates do not have sufficient stability to be suitable for the demanding conditions of LNG fires. High performance Expandol three percent high-expansion foam concentrate was found to be the most effective foam tested, even more so than the latest and considerably more expensive AR-AFFF concentrates.

However it is strongly recommended that any foam concentrate, or generator selected, should be proven and independently witnessed as effective on test LNG fires greater than 60m$^2$ area, before use in any modern LNG installation. Lower quality concentrates collapse too quickly and the draining water from the foam boils the LNG, intensifying the fire and breaking down the foam blanket faster so that a deep and stable foam layer cannot be achieved, even when higher application rates may be used.

A number of passive systems were also investigated including intumescent coatings for steelwork to minimise distortion, but some of these gave off flammable vapours, which sustained ignition for prolonged periods.

The use of passive low-density cellular glass blocks was also subsequently tested. These float on the LNG surface and reduce the heat feedback to the pool thus significantly reducing fire intensity and heat radiation. They worked well on a 65m$^2$ LNG pool fire when newly installed. Concerns raised that residual moisture from humidity, dew or recent rainfall could cause them to be frozen to the impounding basin floor and sides during an LNG spill, potentially holding them beneath the LNG surface, were overcome by raising them up on supported steel mesh. Over time dust, debris and degradation of containment sacs may reduce their efficiency or buoyancy, so their long term reliability and effectiveness probably has still to be evaluated.

Without ignition, there was some vapour reduction from these glass blocks, but they generated no warmth to encourage the LNG vapour to rise, making it significantly less effective than a well-designed high-expansion foam system, which achieves rapid vapour reduction and dispersion upwards, minimising risk of ignition. Foam also delivers rapid and effective fire control, should ignition subsequently occur at a higher level.

## Are You Adequately Prepared for an LNG Spill?

Well-designed active foam systems should reliably reduce the impact of both an un-ignited LNG spill and vapour ignition. By reducing vaporisation rates and dispersing vapours upwards, the risk of ignition is minimised. Delivering a controlled LNG burn-off quickly reduces radiation intensity, should the vapours ignite. Regular top up with high expansion foam during this controlled burn-off period will maintain acceptably low radiation levels, until all the LNG has safely burnt away and the flames self-extinguish.

Even during clean-up, care must be taken to use gas detectors, as small pockets of LNG can still be trapped in the ice layers that form at the LNG interface with the high-expansion foam blanket. To see how LNG behaves during these fire tests, Angus Fire's comprehensive HD video "Demystifying LNG" is now available on YouTube.

But when was your system last tested and proven to deliver the correct expansion ratio and flow rate, so it can be considered to be in good working order? How has it stood up to corrosive salt-laden winds on coastal sites? Will it withstand the rigors and intense radiant heat of an LNG fire, and then adequately protect the facility from severe radiant heat exposure for up to an hour, or more?

Maybe it is time to review your current LNG fire protection by seeking advice from experienced LNG fire system design specialists who can review the effectiveness of your current systems. They can also make cost-effective recommendations about improvements that could significantly reduce your risks, should the worst happen and a major LNG spill occurs in the facility. Are you trained and well prepared to effectively control such an eventuality? Who can assist you with controlling an emergency LNG situation?

Perhaps a combined glass block and high-expansion foam system installation may enable lower foam application rates to be used effectively in future, reducing the capacity and number of generators required, for specific installations.

### Conclusions

Extensive testing has proven that specially designed high-expansion LNG foam generators and wind protective hoods, when used with a high performance high-expansion three percent foam concentrate, plus quick and reliable foam proportioning systems capable of mixing foam into the water supply as soon as the system is activated, are essential. This avoids water entering the LNG pool, and provides highly effective control of LNG spill incidents, whether for vapour dispersion or fire control. Much work on application rates has also confirmed that 10L/m$^2$/min provides the rapid and effective control necessary to prevent incident escalation and reduce risk of severe business interruptions.

This research formed the basis for key recommendations in the EN13565-2:2009 standard's section on liquefied flammable gases, and BP's LNG fire protection and emergency response booklet available through the Institute of Chemical Engineers. Both are well worth a read.

Fortunately there have been very few major fire incidents in LNG facilities, but let us ensure we are not being complacent. Are we taking the risk and possible consequences of an LNG spill seriously enough, in our system designs? Are we possibly relying on inadequate equipment that has not been tested or proven capable of delivering the protection expected, should an LNG spill occur in your facility? Perhaps it is worth getting it checked out, tested and replaced now, if inadequate, before any LNG incidents occur? . **APF**

**Mike Willson** is a firefighting foam specialist

For further information, go to www.angusfire.co.uk

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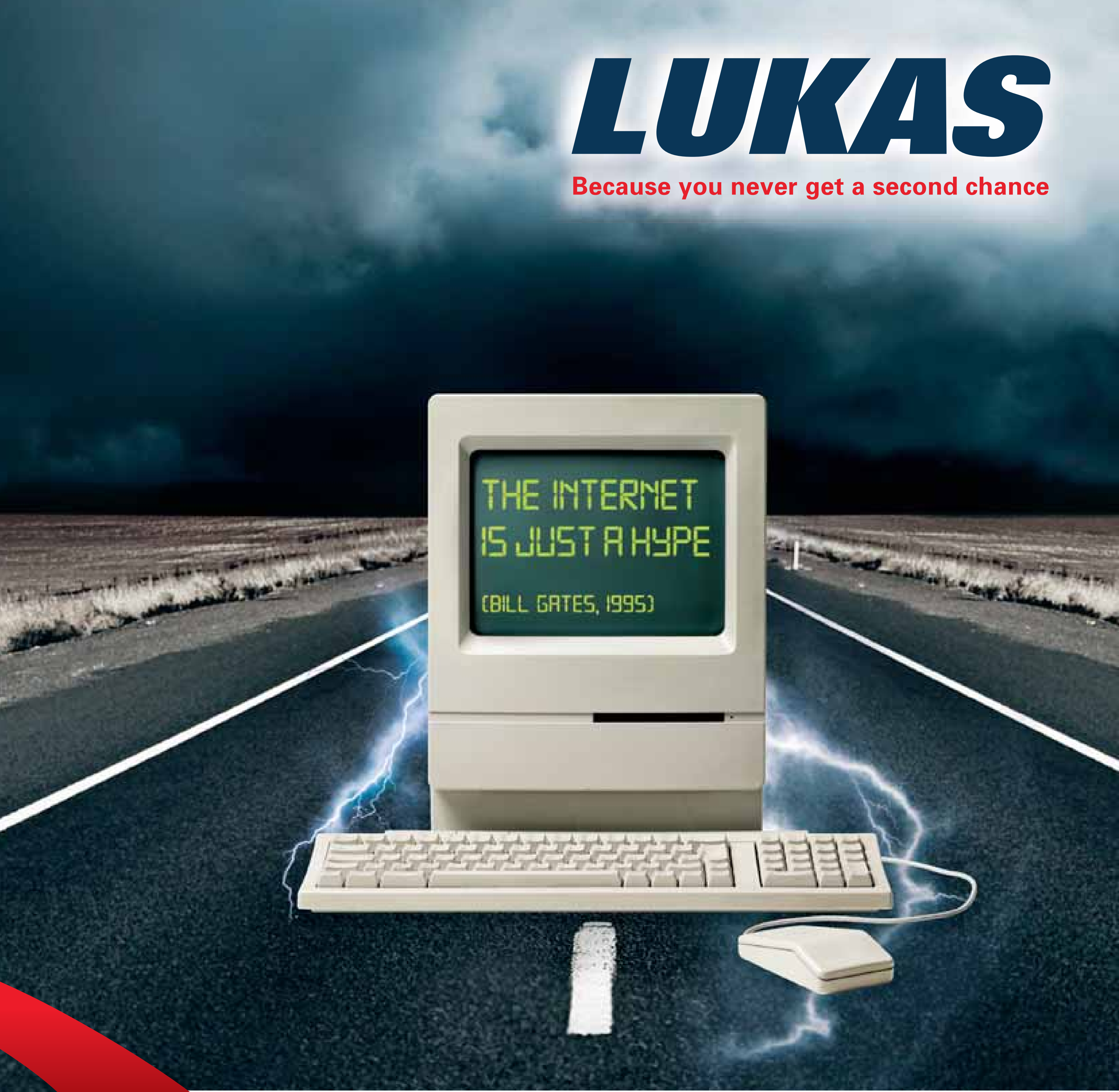

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# Truck Accidents – a True Challenge . . .

**Axel Topp**

Nueremberg Fire Brigade

Just as a child is not a small adult from an emergency medical perspective, a truck is not just a big automobile. Accidents involving trucks have their own essential aspects that make them a special challenge.

Usually a truck is considerably heavier than a car. In a rear-end collision with another truck, much larger amounts of kinetic energy are involved, resulting in much higher deformation energy than for cars. Given this, it is no surprise that trucks are designed with reinforced front ends that pose serious problems for fire brigades. Here the required relief cuts call for cutters that not only deliver outstanding cutting power but also an effective cutting geometry with pull effect.

Besides the reinforced passenger safety cell, the patient is of course also at a much higher working position, making it more difficult for rescuers to gain access for initial contact and later extrication. Here the Lukas rescue platform makes a big difference.

Truck accidents (one truck rear-ending another) take up a lot of space. If such an accident happens on the motorway, it may be a good idea to keep space free for a crane when organising the work area at the accident scene. In special cases, a fire brigade crane can be a decisive aid for technical rescue when a vehicle needs to be lifted or towed. But as far as the use of rescue tools is concerned, it can also result in long paths from the fire engines to the accident scene. Carrying rescue tools, hydraulic power units and assorted safety equipment takes time. This is exactly where rescue tools that do not need for heavy hydraulic power units come into their own. In addition, it is easier to work inside the vehicle with these "hoseless" tools.

With the aid of a mnemonic scheme that has proven effective in accident rescues for automobiles, the tasks in such an accident can be worked through methodically and nothing gets forgotten.

SIBORFA (from the German SEBTEFÜ) includes the following modules: **S**ecure; **I**nitial contact; **B**attery management, **O**pen door; **R**oof removal; **F**ree legs; **A**mbulance. These modules can be combined at the scene in accordance with the situation.

The following will highlight only peculiarities that distinguish truck accidents from car accidents.

- **Secure**

The Secure module includes a range of activities such as securing the accident area, assessing the overall situation, fire safety, securing and supporting the vehicle, glass management, removal of interior trim, and marking planned cuts. A

complete assessment of the situation is particularly important. After finding ways to gain access to the patient and looking for leaking fluids, checking the load is crucial. If hazardous materials are leaking, it can have fatal consequences for the rescuers.

The vehicle can be kept from rolling away by chocking the wheels or securing it with a winch. In this situation, winches should be used with special care; an 80kN winch will not be able to adequately secure a 40-ton truck on a slope. The passenger safety cell can be secured against unwanted movement with a truck securing set (tension belts and endless slings).

After securing the site, try to get a rescuer to the patient as quickly as possible so that vital parameters can be checked and decision about necessary speed of the rescue can be made. The quickest way that comes to mind to achieve this is of course a door that can still be opened. An alternative is the removal of the front windscreen as part of glass management. Sabre saws can provide a decisive advantage here as a truck's windscreen is much larger than that of a car. Initial contact with the patient is much easier when the rescue platform has already been set up.

- **Battery Management**

In Battery management it is very important to ensure that the battery is not disconnected until the seat has been blocked in position. Disconnecting the battery, switching off the ignition or pressing the emergency stop button on a hazardous materials vehicle can lead to sudden lowering of the pneumatically adjustable driver's seat. This can reduce the pressure on trapped extremities, causing blood to accumulate in the legs. Lack of blood in circulation can result in shock. So if there is a pneumatic seat, never disconnect the battery or switch off the ignition if the seat has not been blocked in place.

- **Open Door**

When Opening the door for enhanced patient access, keep in mind that it can weigh as much as 80kg to 100kg. Before detaching the door in the hinge area, secure it from the other side of the vehicle with a rope.

- **Roof Removal**

Removing the roof of a vehicle that is lying on its side can be a very useful enhancement for rescue extrication; here sabre saws and angle grinders have proven effective.

- **Freeing Legs**

For Freeing the legs, use the two-cylinder method.

Insert the first cylinder parallel to the rocker panel at the level of the door lock after making a relief cut parallel to the rocker panel in the A-pillar. The cut in the A-pillar should be made along the markings,

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downward towards the patient. The first rescue-ram pushes the front end forwards, releasing the trapped patient. The use of telescopic cylinders that have double strength in their first stage is especially effective for trucks. If this does not release the patient, relief cuts at the front of the vehicle to decouple it from the affected side of the vehicle are effective. Then position a second rescue-ram between the edge of the roof and the front edge of the dashboard or the A-pillar to stabilise the front end in the current position. The first rescue ram can now be removed to allow access to the patient.

- **Ambulance**

For transfer to the Ambulance, that is extrication of the patient from the vehicle, a scoop stretcher or spine board can be used, or a KED in combination with a scoop stretcher or spine board. For extra support, the KED can be pulled on with a pulley on a turntable ladder. Then the patient slides onto the scoop stretcher more easily. To do this, space to set up the ladder must be kept available in the work area, which is not always so simple.

As described, there are certainly peculiarities to consider in truck rescues. Such operations, which are not exactly everyday activities, pose special challenges that fire brigades must be prepared to meet. To do that, an illustrated set of guidelines, such as the new poster about truck rescues produced by Lukas in association with the Nuremberg Fire Brigade in Germany, can help. APF

**Axel Topp** is Chief Fire Inspector for Nueremberg Fire Brigade

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# New Technology Redefines Total Room Fire Suppression

**Scott Starr**

Firetrace International

Total room flooding systems are now in widespread use around the world protecting a variety of mission-critical installations – particularly computer suites and communications centres – from the ravages of fire. They are also to be found safeguarding document archives and irreplaceable heritage, artistic and historic artefacts in galleries and museums. However, the development of delivery system designs has not kept pace with the introduction of the latest clean agent suppression agents.

In the past two decades or so, since the Montreal Protocol – the international treaty designed to protect the ozone layer – came into force, much of the fire industry's attention has been focused on replacements for the Halon 1301 gaseous suppression agent that the treaty banned. The intervening years saw the introduction of a number of substitute systems. Of these Halon-like halocarbon or HFC alternatives, some proved of worth, while others failed to come up to the mark due to either a lack of operating efficiency or unacceptable toxicity. Their availability on the market nevertheless certainly aided the Halon phase out programme and assisted in the move away from ozone depleting substances.

Since 3M introduced its Novec 1230 Fire Protection Fluid in 2003, many in the fire protection industry – fire suppression system manufacturers, installers, fire safety engineers and specifiers – have adopted it as a suppression agent of first choice.

*Photograph courtesy of Chad Teer*

## The Missing Ingredient

While the environmental, sustainability and performance credentials of Novec 1230 Fire Protection Fluid are now well understood, since its introduction little has been done to capitalise on the unique characteristics of the agent.

Until now, delivery system design has effectively languished in the 1990s, with solutions conforming to conventions and design limitations developed specifically for Halon 1301. The result is that the entire raft of benefits that Novec 1230 Fire Protection Fluid has the potential to deliver has never been fully exploited. Total room flooding installations have often remained far more complicated than necessary; installation costs have been markedly higher; design flexibility has been greatly restricted; and installation times have been significantly longer than necessary.

**Until now, total room flooding installations have often remained far more complicated than necessary; installation costs have been markedly higher; design flexibility has been greatly restricted; and installation times have been significantly longer than necessary.**

These shortcomings have now been resolved. Following an extensive research and development programme and thorough in-house and third-party testing, USA-based Firetrace International has unveiled its "next generation" evolutionary system with approval testing that has demonstrated that the system delivers substantial and measurable performance enhancements when compared with traditional delivery systems. The "industry standard" flow calculation method has been optimised in order to exploit the superior flow characteristics of the Novec 1230 Fire Protection Fluid.

## Evolutionary Engineered Fire Suppression

Firetrace International's new engineered clean agent technology system is called $E^4$. It uses 35bar (500psi) high pressure efficiency, utilising lower-cost, low pressure hardware that has been optimised for the characteristics of Novec 1230, while achieving the performance of more costly high-pressure or "nitrogen driver" systems.

The system complies fully with every aspect of NFPA 2001: 2012 (Standard on Clean Agent Fire Extinguishing Systems) and BS EN 15004:2008 (Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance).

In addition to incorporating a number of innovative engineering developments, the new $E^4$ system offers system installers greater flexibility, speedier installation, significantly lower overall installed cost and a measurable competitive edge. End-user benefits come in the form of a much lower financial outlay when compared with other systems on the market, and greatly improved design freedom. Significantly, by merely replacing the cylinders and nozzles, $E^4$ provides a swift, least-cost transition from most existing Halon systems to 3M Novec 1230 Fire Protection Fluid clean agent technology.

The system is designed to drastically slash the amount of piping used, and the number of tees and nozzles, with savings on distribution network alone being typically between 25 percent and 40 percent. At the same time, the challenge of having to accurately equally balance the amount of agent at Bull T and Side T connections has been overcome, plus extra pipe lengths between tees is either minimal or completely unnecessary. With $E^4$, Firetrace International engineers have devised a system where the Bull T split can be up to an 88/12 split, while the Side T can be as much as 55/45 and 93/7 split.

The result is an installation that can show more than a 50 percent saving on labour costs – irrespective of the size of the installation – by "smart" pipe layouts that are impossible to achieve with the design limitations of industry-standard systems.

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The actuation system has been designed to be stackable, and the cylinder storage problems often associated with gaseous total flooding systems have been consigned to the history books. With the new Firetrace offering, the distance between the agent storage cylinder and the discharge nozzle is more than 300 percent longer than old-technology systems on the market, and the vertical distance is increased by more than 400 percent, so the remote storage of cylinders is no longer a challenge.

With conventional systems the maximum possible cylinder-to-nozzle distance is frequently no more than 20 metres to 25 metres. This often means that cylinders have to be located in the room being protected. However, thanks to the extended pipe lengths achievable with $E^4$, the distance benefits associated with inert gas systems are now achievable with Novec 1230. So, by capitalising on these extended pipe lengths and utilising an array of directional valves it is feasible to protect an entire facility from a single bank of $E^4$ cylinders.

The liquid agent-to-pipe volumes are up by 700 percent; and higher fill density means more agent in the same hardware. And all of this is achieved without the need to incorporate expensive Nitrogen driver systems, so making it possible to install the largest possible networks without having to resort to incorporating extra equipment.

$E^4$ system cylinders are available in eight capacities with fill volumes ranging from 4kg (8lbs) to 590kg (1300lbs) – the largest single cylinder capacity in the industry. Each of these cylinders can be under-filled in half-kilogram increments to provide the exact amount of required Novec 1230 agent. Systems can be activated either manually or automatically using mechanical, pneumatic or electrical activation. High flow rate nozzles reduce the number required and are available in centre and side discharge patterns for pipe sizes ranging from 12.7mm (0.5 inches) to 63.5mm (2.5 inches).

Firetrace has assessed that more than 75 percent of the existing Halon distribution networks around the world can be easily and cost-effectively refitted with its $E^4$ utilising the existing piping. This presents installation companies with a major business opportunity while, for end user organisations with Halon systems, it offers the very real prospect of minimised system downtime and the shortest possible business interruption, as well as substantial cost savings.

## Genuine, Lasting Sustainability

Novec 1230 Fire Protection Fluid provides an opportunity for end users to fully embrace sustainable and environmentally-welcome technology. The agent leaves no residue to clean-up after discharge, and does no damage to the sensitive electronic equipment or documents it is intended to protect. Significantly, Novec 1230 is also safe for discharge in occupied areas, offering the highest safety margin of any clean agents.

Novec 1230 is stored in cylinders as a low vapour pressure fluid that transmutes into a colourless and low odour gas when discharged. The agent has zero ozone depleting potential and a remarkably low atmospheric lifetime – the time it takes to break down in the atmosphere – of just five days. It also has an insignificant global warming potential of one.

Added to these impressive environmental suppression agent credentials, the $E^4$ system makes a major contribution to carbon footprint reduction. This is due to the significantly reduced amount of material $E^4$ utilises to protect a large facility, by using a single bank of storage cylinders connected to directional valves instead of having to install individual systems to protect individual rooms. This results in savings in raw materials, less energy being expended in processing and manufacturing, reduced transportation and decreased emissions.

The Firetrace $E^4$ cylinders are UL (Underwriters Laboratories) listed and are manufactured, tested and stamped in accordance with DOT 4BW500 or DOT 4BA500.

Significantly, in an era when every square metre of floor space has to earn its keep, Novec 1230 storage requires fractionally over a third of the space of a $CO_2$ installation and just over ten percent of the space demanded by an inert gas system. In fact it occupies a similar footprint to a Halon 1301 installation.

$E^4$ is manufactures by Phoenix, Arizona-based Firetrace International in an AS9100C/ISO 9001:2008-certified facility. APF

**Scott Starr** is Director of Marketing at Firetrace International

For further information, go to www.firetrace.com

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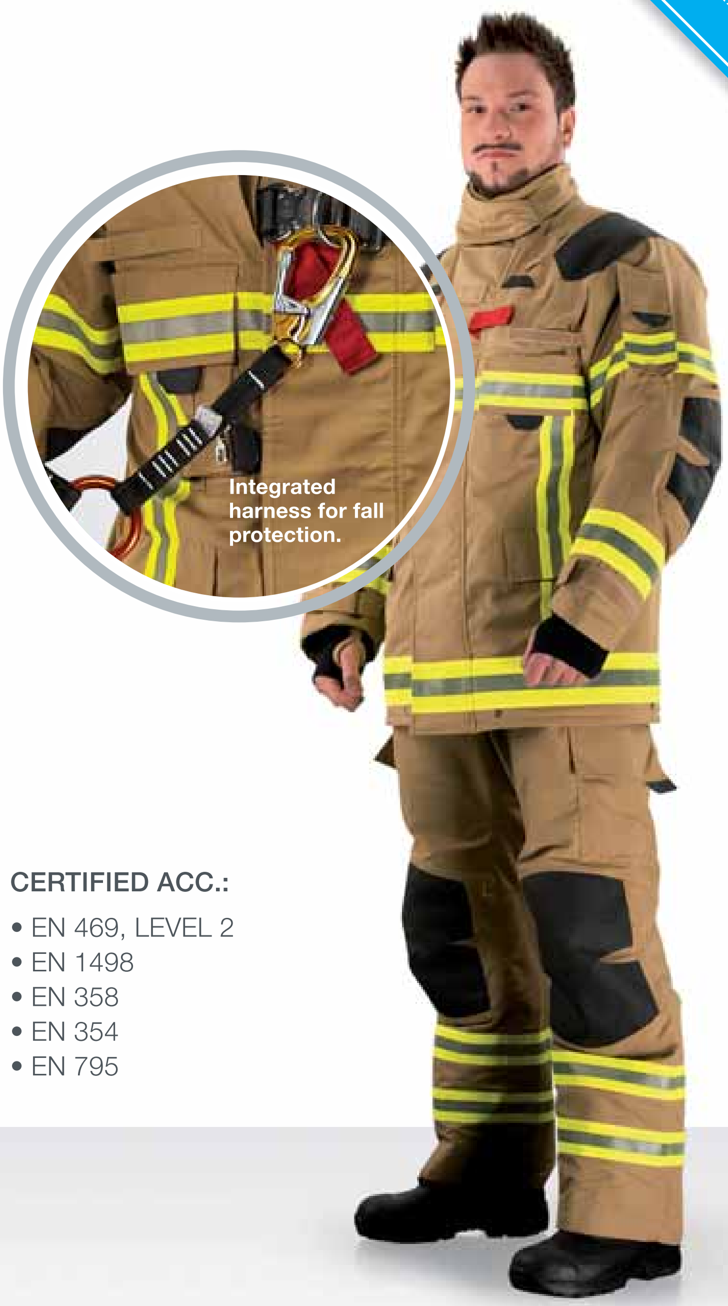

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**Andy Caughey**

Armadillo Merino

# Merino Wool Makes a Comeback

We now live in a synthetic dominated world where we have been persuaded into believing that man-made fibres for clothing are superior to natural fibres for work wear. We have forgotten the complexity and versatility of wool as nature's performance fibre in providing the essentials in clothing that we need for survival.

The wool textile industry has changed dramatically over the past thirty years following investment and innovations that have taken place at every stage of the value chain. This quiet transformation of the industry has been most dramatic where wool producers and scientists have used selective breeding of merino sheep (a sheep breed prized for its fine fibre) to grow wool as fine as 11.0 mu, that is even finer than cashmere. These fibres are genetically strong and are the essential building blocks for producing superfine fabrics with softness, strength and easy care properties suitable for functional multipurpose garments.

The other significant area of advancement has been in the development of new manufacturing technologies for the processing of these super-fine fine wool fibres. New equipment at the spinning and knitting stages is converting the super-fine wool fibres into innovative wool fabrics that would not have been possible even ten years ago. Compact yarns converted into technical knit structures have created some of the most advanced multi-attribute fabrics in the world today, far superior to any of their synthetic alternatives, offering the user a broad range of benefits. But now, with an improved user experience, it is no longer itchy, scratchy and hard to care for.

Most importantly this super-fine merino wool, when worn next-to-skin, will enhance the protection, performance and comfort of fire and rescue personnel operating in high risk environments.

## Heat & Flames

Have you seen the skin injuries incurred from synthetic garments melting into the skin? The hi-tech wicking t-shirts popularised by sportswear brands are injurious and potentially life threatening for anyone involved in the fire and rescue service. A small flame or a burst of heat is all it takes to turn these garments into molten plastic that burns into the skin. Nylon melts at only 160°C and burns robustly at 485°C. In contrast merino wool does not melt, drip or stick to the skin and has natural fire resistant properties up to 600°C.

By issuing a merino base layer you are providing an extra layer of protection for the firefighter against both heat and flames. By issuing long sleeve merino garments you can reduce the discomfort of sweaty inner elbows because of the way merino handles moisture and reduces the potential for lower arm burns that can come from wearing short sleeves.

## Heat & Moisture

At some stage, all fire service personnel experience excessive moisture loss and heat exhaustion.

Wicking fabrics made from synthetics have limitations for firefighters as wicking garments only work if properly layered, allowing for the moisture and heat to escape if it can be released into the environment. Synthetic fibres do not actively manage the moisture from perspiration (absorb and release) but rely on evaporation to move excess moisture away from the skin. When worn as part of a multi-layered system, the evaporation process no longer takes place, leading to moisture and heat build-up within the firefighter's PPE. The build-up of perspiration around the body also increases the propensity for steam burns from your own sweat. This single reason should be a major concern for any fire service issuing synthetic base layers.

Merino wool works quite differently to cotton or synthetics. The outer cuticle of the merino wool fibre is hydrophobic (repels moisture) while the inside is hydrophilic (absorbs moisture). Wool actively manages moisture in both a liquid and vapour state through its natural chemical structure, allowing merino wool to absorb up to 35 percent of its weight as moisture without feeling wet, and then releasing the moisture back into the environment. A layer of merino knit worn next-to-skin will improve the feeling of comfort and helps towards maintaining a more stable core body temperature in high sweat environments because

of its inherent ability to moisture manage and thermo regulate thereby reducing the potential for steam burns.

### Cold & Wet

Search and rescue call outs can happen on the coldest, wettest days, and the sweat/chill cycle has to be managed when working for extended hours in a cold or wet environment. The skin is your body's thermometer and greatly influences your operational effectiveness. All firefighters have experienced the discomfort of being unbearably cold, but you do not need to feel that level of discomfort as merino can help expand that buffer zone of comfort.

It is known that cotton can kill in cold wet condition because the moist fabric draws heat away from the body and in time lowers the core body temperature. Synthetic garments may initially increase the skin temperature from reflective heat providing a warming sensation but as the fabrics do not thermoregulate, the body starts to overheat increasing the rate of perspiration. In a firefighter's layered ensemble this sweated moisture cannot move away from the body because it needs to evaporate, so it condensates and becomes cold next to skin, which in turn speeds up body chilling, leading to user discomfort.

Merino fibre works differently and more effectively. Merino manages to keep operators warm even when wet by moving moisture away from the skin, working to keep the skin dry and at a more constant temperature. The merino fibre actively manages sweat by absorbing and releasing moisture with the inherent ability to hold up to 35 percent of its weight without feeling wet. This is due to the natural fibre structure of the merino follicle, which acts like a tree with its water repellent cuticle on the outside and its hydrophilic interior transporting the moisture away from the skin to be released into the less humid environment.

### Sweat & Ease of Care

Fire and rescue personnel accept that sweat and odour is part of the job. Your expectation will be to use a number of shirts that are changed to overcome odour issues….but sweat does not smell. Our bodies smell because micro-bacteria feed off the body salts and the moisture we perspire. You could wear a merino garment 24/7 and not produce odour. Merino naturally absorbs sweat and through natural processes prevents the build-up of offensive odours.

### Anti-static

Merino fibre does not hold a static charge, so it can be safely worn in areas where a static discharge could be dangerous, such as around spilt fuel or where there is a risk of an electrical flash over.

### Merino – Nature's Performance Fibre

Merino wool is remarkable for each of these attributes but even more so for the sum of these unique properties, which when knitted into specialist performance garments greatly enhances the protection, performance and comfort of any firefighters operating in high risk environments. But what makes merino wool?

Every year the merino sheep being farmed in New Zealand produce a new fleece weighing approximately four kilograms. The soft merino fibre is harvested annually in the spring months to produce garments that can be worn next-to-skin from head to toe. These merino fabrics and garments are easy-care providing the convenience of machine washability up to 40°C. Merino does not retain odours or dirt, so it can be washed clean in low temperatures and without the need of odour-masking detergents. Line drying is the best way of extending the life of these fast drying, lightweight fabrics.

Garments have a natural wear life, so we have the issue of garment disposal particularly as we deal with growing landfills and the guilt of disposing garments made from non-renewal materials knowing that they will take decades to breakdown. Merino fibres are produced from keratin, the same naturally-produced protein that is the building block for our hair and nails. So when the time has come to discard your merino garment, bury it in the garden. Once the merino comes into contact with soil borne bacteria it breaks down and is absorbed into the soil within nine to 12 months. The cycle is complete.

In summary merino base-layer can enhance the protection, performance and comfort of fire and rescue teams by:

- Having natural flame resistance up to 600°C.
- Not melting, shrinking or sticking to skin when exposed to flames or high temperatures.
- Not producing toxic odours when burning.
- Having the highest natural UVP factor against other fibres for added protection from the sun.
- Having a high resistance to acids.
- Offering greater resistance to chemical residues and aerosols than synthetics.
- Thermoregulation of the skin, reducing overheating or chilling.
- Moisture managing the skin – reducing the rate of moisture lost in exercise and incidence of skin infections.
- Being naturally antibacterial – will not infect wounds.
- Not generating offensive odour even after prolonged use.
- Being soft yet incredibly strong and durable.
- Being annually renewable and are biodegradable.
- Being easy care – being machine washable and quick drying. APF

**Andy Caughey** is Managing Director of Armadillo Merino

For more information, go to www.armadillomerino.com

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# Emergency Planning & Preparedness for Major Hazard Facilities

A major accident at a major hazard facility creates the potential for serious consequences at the facility and for the surrounding community and environment. Globally, major incidents have caused the loss of many lives and cost billions of dollars.

**Stuart Harvey**

MHF Officer, FRNSW

Effective risk management plays an important role in reducing the risk of these types of accidents. However, because of their exceptional nature, major incidents do not typically fit into a standard likelihood/consequence matrix. Risk management needs to be 'fit for purpose' and emergency plans and emergency preparedness are critical risk management elements. Many sites promote their emergency plans as control measures, but they may not be suitable or appropriate.

The introduction of harmonised Work Health and Safety (WHS) laws within Australia is changing compliance obligations for facilities and compliance assessment obligations for regulators. Fire services also have obligations under this legislation to provide comments and recommendations to facilities, which must comply with those recommendations (previously, facilities were only required to have 'due regard' to any comment or recommendation). Compliance now includes all aspects of emergency plan testing.

Although not all Australian jurisdictions have yet adopted the model laws, history has shown that regardless of the jurisdiction in which an accident has occurred, the investigative team will typically explore relevant standards and laws, whether or not they strictly apply. The report of the Longford Royal Commission into the major incident at the Esso site in Victoria is an example, canvassing multiple standards, codes of practice and legislation from within Australia and overseas.

So, this article explores the risks and opportunities presented to both industry and fire services through the introduction of Model WHS legislation, and how an open and collaborative approach can achieve regulatory compliance and improve public safety.

## What are Major Hazard Facilities?

'Major Hazard Facility' (MHF) is a term that has been used around the globe since the early 1970s. MHFs are essentially very large dangerous-goods sites, including the manufacturing, processing and storage industries. Table 1 provides a simple comparison with some common hazardous chemicals, highlighting the differing quantities for placard, manifest and MHF quantities.

**Table 1. Hazardous Chemical Threshold Quantities**

| Substance | Placard Quantity | Manifest Quantity | MHF Threshold Quantity |
|---|---|---|---|
| LPG | 200 L[1]<br>(100 kg approx) | 500 L<br>(250 kg approx) | 200,000 kg[2] |
| Petrol | 250 L<br>(180kg approx) | 2500 L<br>(1875 kg approx) | 50,000,000 kg<br>66,600,000 L |
| Ammonia gas | 50 L<br>(31 kg approx) | 500 L<br>(310 kg approx) | 200,000 kg<br>323,600 L |
| Chlorine gas | 250 L<br>(230 kg approx) | 2,500 L<br>(2,300 kg approx) | 25,000 kg |
| Sodium cyanide | 50 kg | 500 kg | 20,000 kg |

1. For dangerous goods, quantities of liquefied gases are expressed in litres of water capacity of the containing vessel.
2. For major hazard facilities, thresholds are expressed as weight of material in kilograms or tonnes.)

Due to a number of accidents around the world that resulted in significant consequences, workplace regulators introduced a new layer of regulatory compliance aimed at eliminating, or at the very least minimising, the likelihood and consequences of these accidents. Of importance to the facilities involved, these accidents cause a severe disruption to business continuity.

Schedule 15 (SWA 2011), is a list of substances, which also details threshold quantities. If a workplace has quantities reaching those listed in Schedule 15, the facility is deemed a MHF. Sites that reach 10 percent of the scheduled amount must also notify the state-based regulator, and the regulator may determine the workplace to be a MHF (determined MHF), whether or not the scheduled amount is reached. This determination is based on a number of factors outlined in Clause 541 (NSW WHS 2011).

It is also important to note that if there is more than one hazardous chemical present from Schedule 15, a threshold quantity of chemicals exists where the result of the following aggregation formula exceeds 1:

$$\frac{q_x}{Q_x} + \frac{q_y}{Q_y} + [....] + \frac{q_n}{Q_n}$$

Where:

(a) x, y, [....] and n are the hazardous chemicals present or likely to be present;

(b) $q_x$, $q_y$, [....] and $q_n$ is the total quantity of hazardous chemicals x, y, [....] and n present or likely to be present (SWA 2011).

This is also known as the Aggregate Quantity Ratio (AQR).

With the creation of these schedules, the term ‘major incident’ was developed. A major incident is defined in the WHS Regulations 2011 (SWA 2011) as an uncontrolled event at a MHF involving (or potentially involving) a Schedule 15 chemical, and exposing a person to a serious risk to health or safety from the occurrence. Internationally, this definition is virtually in universal use. These events are typically acknowledged as ‘low frequency – high consequence events’.

## Australian History of Major Hazard Facility Incidents

In Australia, on the 21st August 1991, an explosion at Coode Island involving a storage tank at Victoria’s largest storage chemical facility, caused 8.5 million litres of chemicals to burn. 250 people were evacuated and two firefighters were injured. Damage and clean-up costs were estimated at Aud$20M million in1991 values.

Following this, on 25th September 1998, an explosion occurred at a gas plant in Longford Victoria. This explosion left approximately 1.4 million households and 89.000 businesses without gas. Two people were killed, and eight people injured. On October 12, 1998, the Victorian Government announced a Royal Commission into the incident. The Longford explosion Royal Commission was the catalyst for the introduction of MHF legislative requirements within Victoria.

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## Australian Legislative Requirements

All Australian jurisdictions have had in place workplace health and safety laws for many years. A difficulty, particularly for multi-jurisdictional industry, has been that these laws vary, creating differing requirements for different states. For example, in New South Wales, a Major Hazard Facility was defined in the OH&S Regulations (2001) Part 6B, specifying the MHF requirements for licensing. Victoria has different legislation in place (Occupational Health and Safety (Major Hazard Facilities) Regulations 2000 S.R. No. 50/2000, revoked on 1 July 2007 by regulation 1.1.4(1) (Schedule 1) of the Occupational Health and Safety Regulations 2007, S.R. No. 54/2007).

In addition, Western Australia has given legal affect to the National Code of Practice for the Control of Major Hazard Facilities (1996), an otherwise voluntary code of practice.

In July 2008, the Council of Australia Governments formally committed to the harmonisation of WHS laws by signing an Intergovernmental Agreement for Regulatory and Operational Reform in OHS (IGA). The IGA outlines the commitment of all states and territories and the Commonwealth to work together to develop and implement model work health and safety laws as the most effective way to achieve harmonisation in Australia.

With the introduction of Australian National Model Laws for 'Work Health and Safety' (WHS), obligations will change for facilities with compliance, and regulators in assessing compliance. Table 2 details the progress made by each of the Australian jurisdictions on the implementation of the Work Health and Safety Laws. As will be noted, New South Wales has implemented the NSW WHS laws effective from 1 January 2012.

## Risks

The focus of this paper is preventing disruption to business continuity. The cost of business disruption from major incidents is significant. These costs arise from direct damage caused by the incident (including stock replacement, repairs, and clean-up costs), but also demurrage and corporate brand damage. Of course, prosecutions and fines add to this expense list. Regulatory compliance is aimed at preventing these incidents, and minimising the consequences of them if they do occur.

Regardless of where a MHF operates, compliance with the jurisdictional workplace safety laws is mandatory. It is noteworthy, however, that for those operating in Victoria or Western Australia (the states that are yet to adopt the WHS legislation), benefit is gained from ensuring compliance with the WHS legislation. For those jurisdictions that have adopted WHS legislation, legislative requirements have changed, so new obligations are required to be fulfilled for compliance.

The report of the Longford Royal Commission is an inquiry into and a report of the causes of the explosion and fire that occurred on 25 September 1998 at the gas production and processing facility operated by Esso Australia Resources Ltd. at Longford, Victoria.

This report investigated legislative requirements and Codes of Practice from all Australian jurisdictions, and also reviewed material from international contexts. These included the Seveso Directive applying to all European Union states and Control of Major Accident Hazards (COMAH), applying to

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DRY WEIGHT: **125 Kg / 275 lbs**

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POWER: **3,5 Kw / 5.5 Hp**
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**Table 2. Jurisdictional Progress on Model WHS Laws**

| Jurisdiction | Introduced to parliament | Passed | Date of Implementation |
|---|---|---|---|
| **Commonwealth** | | | |
| Work Health and Safety Act 2011 | 6 July 2011 | 24 November 2011 | 1 January 2012 |
| Work Health and Safety Regulations 2011 | Made 7 December 2011 | Registered 14 December 2011 | 1 January 2012 |
| **Australian Capital Territory** | | | |
| Work Health and Safety Act 2011 | 23 June 2011 | 20 September 2011 | 1 January 2012 |
| Work Health and Safety Regulation 2011 | | 19 December 2011 | 1 January 2012 |
| **New South Wales** | | | |
| Work Health and Safety Act 2011 | 5 May 2011 | 27 May 2011 | 1 January 2012. Laws relating to officers' due diligence duties are already in effect |
| Work Health and Safety Regulation 2011 | | 16 December 2011 | 1 January 2012 |
| **Northern Territory** | | | |
| Work Health and Safety (National Uniform Legislation) Act 2011 | 27 October 2011 | 1 December 2011 | 1 January 2012 |
| Work Health and Safety (National Uniform Legislation) Regulations | | 30 December 2011 | 1 January 2012 |
| **Queensland** | | | |
| Work Health and Safety Act 2011 | 10 May 2011 | 26 May 2011 | 1 January 2012 |
| Work Health and Safety Regulations 2011 | Approved on 24 November 2011 | 29 November 2011 | 1 January 2012 |
| **South Australia** | | | |
| Work Health and Safety Bill 2011 | 19 May 2011 | | Parliament voted to adjourn debate on the Work Health and Safety (WHS) Bill until further notice |
| **Tasmania** | | | |
| Work Health and Safety Bill 2011 | 18 October 2011 | 13 March 2012 | Amended commencement date of 1 January 2013 accepted by the Lower House on 13 March 2012. |
| **Victoria** | | | |
| Not yet introduced | | | The Victorian Government announced it would delay harmonisation |
| **Western Australia** | | | |
| Not yet introduced | | | The Western Australian Government has announced that it is unable to meet the 1 January 2012 implementation timeframe |

the United Kingdom. The report recommended the implementation of a MHF regime in Victoria, which was subsequently enacted. Prior to this, only one level of regulatory enforcement applied, which was dangerous goods legislation.

Under previous Dangerous Goods (Hazardous Chemicals) Regulations, sites had discretion in relation to the extent that comments and recommendations made by the primary emergency service organisation were applied. For example, the NSW OH&S Regulations (2001) Part 6A Clause 174 ZC states:

*In developing or reviewing the emergency plan, the occupier must:*

*(a) provide a draft of the emergency plan to the Commissioner of the New South Wales Fire Brigades, and*

*(b) have regard to any written advice received from the Commissioner of the New South Wales Fire Brigades.*

With the OH&S legislation repealed, the WHS legislation [NSW WHS Regulations (2011) Regulation 361 (3)] states:

*If the primary emergency service organisation gives the person a written recommendation about the content or effectiveness of the emergency plan, the person must revise the plan in accordance with the recommendation.*

Thus, it is made clear that the discretion that sites previously had in relation to addressing comments and recommendations has now been removed. Also noteworthy is the scope of the emergency service, providing comment has been expanded to explicitly mention both content and effectiveness.

Interestingly, the WHS MHF Regulations are not as onerous as the WHS Hazardous Chemicals Regulations. NSW WHS Regulations (2011) Regulation 557 (3&4) states:

*(3) The operator must ensure that the emer-*

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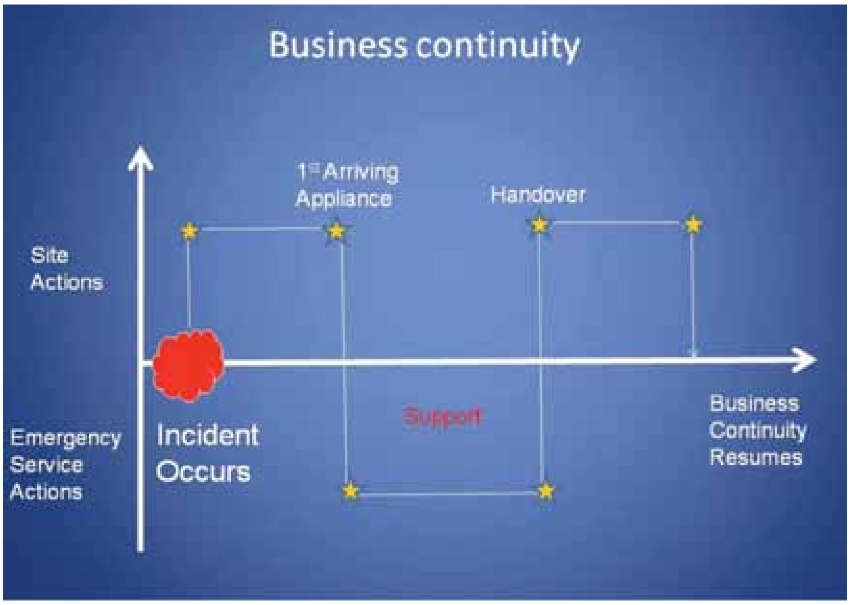
*Diagram 1: Emergency Timeline*



*gency plan addresses any recommendation made by the emergency service organisations consulted under sub regulation (2) in relation to:*

*(a) the testing of the emergency plan, including the manner in which it will be tested, the frequency of testing and whether or not the emergency service organisations will participate in the testing; and*

*(b) what incidents or events at the major hazard facility should be notified to the emergency service organisations.*

*(4) The operator must have regard to any other recommendation or advice given by a person consulted under sub regulation (2).*

It is noteworthy from these MHF Regulations that recommendations on the testing of the emergency plan must be addressed, along with when a MHF should notify the emergency service organisation. While all MHFs are also Hazardous Chemical sites, and any recommendation made under the Hazardous Chemical Regulation 361 must be addressed, the intent of MHF Regulation 557 (3&4) should be considered. If an emergency service organisation provides a comment or recommendation outside of testing an emergency plan or notifications to a MHF under Regulation 361, it must be addressed; however, if this same recommendation is made under Regulation 557, only regard must be given by the MHF.

The MHF Regulations implicitly state testing of the emergency plan and notifications to emergency service organisations. It is my view that these areas have been identified as shortcomings through investigations of previous major incidents. This has not limited the emergency service organisations in achieving recommendations being addressed, as they may simply make any recommendation under Regulation 361.

The report 'A review into the response to the serious pollution incident at Orica Australia Pty. Ltd. Ammonium nitrate plant at Walsh Point, Kooragang Island NSW on August 8. 2011' made nine recommendations. One of these in part states: '*Periodically, Emergency Response Exercises be developed and implemented…*' The Select Committee on the Kooragang Island Chemical Leak Report 'Kooragang Island Orica Chemical Leak' was more critical. Finding five and states:'*Orica's Emergency Response Plan and other procedures were not sufficiently clear or comprehensive to enable staff to deal effectively with the situation which occurred on 8 August 2011'.* The report further details in Chapter 5: *'As was revealed in the evidence to the Inquiry, there were differences between the roles described in the documents, particularly the Emergency Response Plan, and those who undertook key tasks…'*

Similarly, the Victorian State Coroner's report into Longford (2002) states: "*It is trite to say that preventative activities, emergency planning and management is an important aspect of running a potentially hazardous facility. That preventative work and planning for potential disaster must be undertaken with full knowledge and in co-operation with the responsible authority'.* The Coroner quite rightly highlights in his conclusion to the Report: '*Paper systems are not effective systems of work unless they are actually implemented'.*

## Opportunities

Both new regulations and previous major incident investigation reports illustrate that emergency plans are an integral component in preventing major incidents, but also in minimising their consequences. These plans must be, however, fit for purpose and functional.

Historically, regulatory compliance of emergency plans has been prescriptive with regard to the content. The shift to being functional is critical. While many prescriptive requirements remain; what is a functional (or fit for purpose) emergency plan, and what is 'effectiveness'?

An emergency plan should provide sufficient detail, responsibility and authority for the appropriate trained staff to fulfil their roles in managing an emergency. Diagram 1 shows a typical timeline of an emergency where a fire service responds, with the stars indicating significant points on the timeline.

Systems must be in place to identify when an incident occurs in a timely manner. This in turn warrants investigation by the appropriate person/s to assess or 'size up' the incident. This then brings us to the first star.

- **Star 1**:
  A critical decision now needs to be made. The appropriate internal emergency resources need to be mobilised (and external notifications) to prevent escalation, with guidance from relevant emergency plan procedures.
- **Star 2**:
  Upon the arrival of the first fire appliance, emergency control is taken by the fire service.

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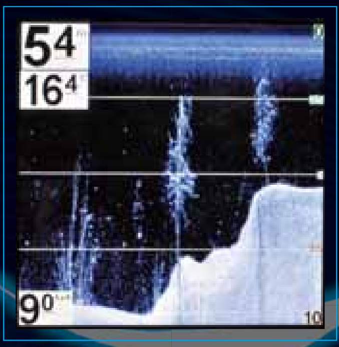

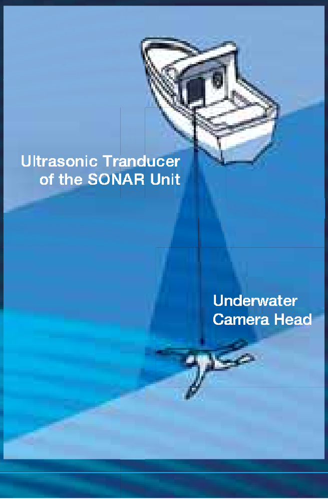

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This is a critical point as the fire service does not possess the intimate knowledge of the site that the site staff should.

- **Stars 3 & 4**:
  It is here that the site should provide relevant support to the fire service in providing the appropriate skills, knowledge and resources to deal with the incident at hand. This ensures the most appropriate strategy and tactics are used, minimising the severity of the incident.
- **Star 5**:
  Once the emergency is rendered safe, the fire service will hand back control of the site. In some instances, the fire service may hand the site to the Police or workplace Regulator (for example in the event of a death), but in this instance, we will assume the site is being handed back to the operator. There are many things at this point that the operator needs to consider and prioritise. Isolation of affected areas is paramount, for investigations (both internal and statutory) but also for worker safety. Root cause analysis, repairs and maintenance, replenishment of used emergency equipment, clean up, all clear, and termination of incident are all important aspects to be dealt with. Without clear direction, provided in the emergency plan on how to achieve these outcomes, the effect of the incident will escalate.
- **Star 6**:
  This is where the incident is terminated, with clear procedures in place to resume business operations.

It should be the clear objective of every operator to minimise the escalation of any incident from the business continuity line.

Research conducted by Glavan and Palaneeswaran focussed on the investigation of five major accidents at MHFs, identifying six common characteristics. These were: the failure to undertake risk assessment of major changes; the failure to provide adequate process alarms; defective design of major plant; the failure to provide effective safety culture leadership; human factor errors; and the failure to learn from other major accidents.

These characteristics are important as common contributors to accidents and certainly should be addressed; however, on the assumption that they are, and a fit for purpose emergency plan is implemented, successful site emergency response to an incident is not guaranteed.

The Health and Safety Executive in the UK contracted a research report into performance indicators for emergency preparedness. The report was written to identify improvement opportunities through identifying performance indicators relating to emergency preparedness.

Six features were found to be particularly representative of quality of practical performance. These were: senior management commitment; emergency philosophy; emergency management team structure; information management system; exercise regime; and several specific features of team preparedness. These features of team preparedness included: continuity in membership of emergency teams; training in command and control; competence assurance of emergency managers; and professional coaching of management teams during exercises.

It is quite pertinent to note at this point that the WHS MHF Regulations require performance monitoring in relation to standards for measuring the effectiveness of the mandatory Safety Management System (SMS). Specifically, New South Wales WHS Regulations (2011) Schedule 18, Part 2, Item 4 states: '*A detailed description of the performance standards and performance indicators required by item 7 of Schedule 17 to be included in the safety management system.*' This requirement does not explicitly state it is applicable to emergency plans; however, many MHFs' emergency plans, including the training requirements, are contained within the SMS.

## Conclusion

It is well documented and understood that a major incident at a MHF causes severe interruption to business continuity. The costs associated with a major incident are significant, not least the potential for loss of life. Effective risk management of these facilities is critical in eliminating the potential for a major incident, and for minimising the consequences should it occur.

Effective risk management ensures the control measures are adequate in relation to the expectation and requirements they are to fulfil. Emergency planning and preparedness are important elements of this process and assessment of adequacy. With the introduction of harmonised WHS laws, regulatory compliance obligations have changed, and facilities need to evaluate their compliance against these new requirements. Also, it is important for facilities falling outside the jurisdictions that have adopted the legislation to be mindful that past inquiries have assessed compliance against differing jurisdictional regulatory requirements.

Hence, key focus areas for facilities to assess are ensuring not only that the content of their emergency plan is comprehensive, but also that the plan is 'effective'. Consequently, facilities should employ a testing regime that demonstrates both adequacy of content and effectiveness. To achieve this outcome, a performance monitoring program should be established that reports on identified key performance indicators.

This article has detailed common faults that have led to major accidents, and also key performance indicators for emergency preparedness and response. Effective risk management dictates however that the approach adopted for emergency planning and preparedness must be site-specific. The approach adopted should be one of achieving the desired business outcome, followed by ensuring regulatory compliance. With many MHFs being complex chemical processing sites, the intimate knowledge of potential accidents and appropriate control measures rests with the operator of the facility.

It is with this approach, and through an open and collaborative working relationship with the primary emergency service organisation (specifically the fire services) that improved relationships will be built, leading to the most effective strategies and tactics being employed in the event of an emergency. While it is the clear objective of every fire service to minimise the impact of emergency incidents, it should also be the clear objective of every MHF to minimise the impact of emergency incidents, but further, to minimise the escalation of any incident from their business continuity line. **APF**

**Stuart Harvey** is also the Manager, HazMat Technical Group, Australasian Fire and Emergency Service Authorities Council

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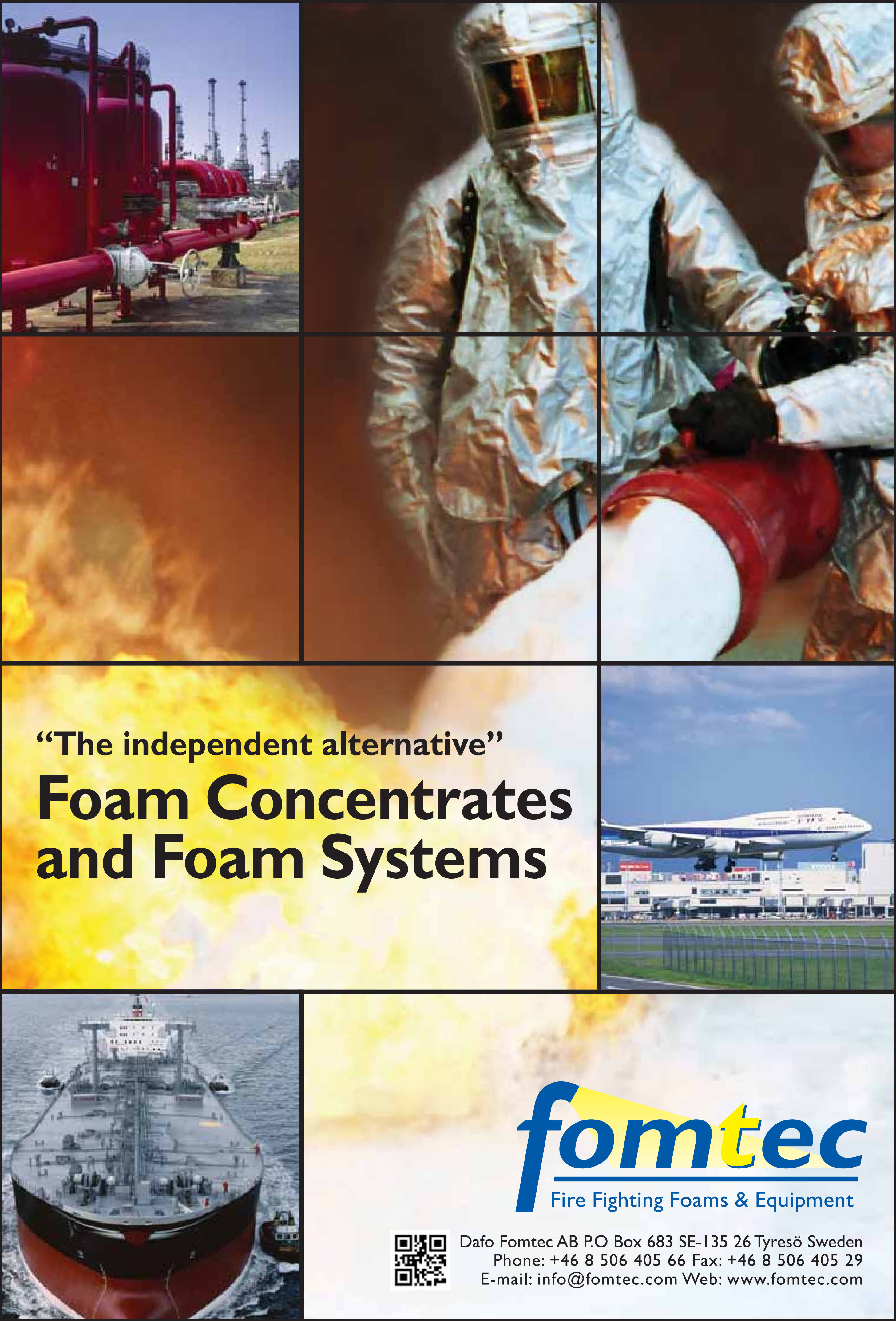

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# Class A Foam and CAFS Training

**Jessica King**

Devon & Somerset Fire & Rescue Service

Class A foam concentrate is a synthetic chemical additive that reduces the surface tension of water so it can penetrate combustible fuel surfaces. When mixed with water it creates a foam solution that is more effective than plain water for flame knockdown and fuel cooling when used for a fire attack.

A compressed air foam system (CAFS) consists of a water source, a fire pump, an air compressor and a foam proportioning system. This system aspirates the solution by introducing compressed air, which allows for a more efficient use of the firefighting media. This move from hydraulic to pneumatic pressure enables fire crews to maximise their water supply and ultimately reduce the property damage that can occur when fighting fires with water alone.

Class A foam concentrate supplied through CAFS enables a more efficient use of resources, which has undoubtedly led to an increase in Class A foam use within fire services across the world. More importantly, this has had a positive impact upon firefighter safety. By reducing knockdown times, the use of compressed air foam can dramatically decrease the exposure time for firefighters

within risk areas. Using well trained techniques, the resulting reduction in heat and toxic by-products can have only a positive impact upon firefighter safety.

Class A CAFS can be used in wet and dry modes, each offering different benefits. Wet compressed air foam is used for fire attack and cools fuel surfaces. The bubble structure created by the CAFS enables the firefighting media to adhere to three dimensional surfaces. This allows the majority of the finished media to evaporate and cool on the fuel surface.

By removing a quantity of water from the mixture, a shaving foam consistency dry compressed air foam firefighting media can be produced. Dry compressed air foam should not be used for firefighting attack. Its purpose is to create a protective barrier and to provide exposure protection to reduce the impact of an impinging flame against a nearby building or structure.

Within Devon and Somerset Fire and Rescue Service (DSFRS), compressed air foam has been used operationally and has provided a more targeted efficient use of resources at certain incident types. Crew Manager, Matthew Head, a CAFS instructor at the DSFRS Academy said: "Within the Academy we impress upon students the importance of a clear underpinning theoretical understanding of Class A foam and CAFS. This is reinforced with reference to case studies based upon recent incidents and real hands on practical sessions to ensure that all our personnel are operating using safe, effective and quality assured techniques".

The Training Academy teaches students how to use Class A foam and CAFS, and also focuses clearly on when it should not be deployed, which is why quality training underpinned by clear policies and procedures is the cornerstone of the Academy's approach to training. Matthew Head explains: "We do not teach the use of CAFS for internal firefighting. There are currently no guidelines for the use of compressed air foam as a gas cooling media in compartment firefighting”.

As already pointed out, a major benefit associated with using compressed air foam is that the water usage is greatly reduced. When water is used at fire related incidents, around 80 percent of this firefighting media is lost in run off, which ultimately can be full of contaminant. This can end up washing into surface water drains and other water supply systems. Another advantage of using compressed air foam is that the hose lines are around 60 percent to 70 percent lighter, which makes a huge difference in terms of manual handling.

Matthew Head continued: “In the 1980s, Class A foam was extensively used for wildfires in the USA. Over the past three decades we have seen its use develop into other incident types. Locally we have seen it used at thatch (roofs built with straw or water reed) fires, fuel spill/pool fires, large refuse disposal sites and wildfires to name a few. With the current international financial climate it is not surprising that the use of Class A foam through compressed air foam systems is becoming an international trend; fire and rescue organisations are having to solve an equation that involves improving firefighter safety within an ever decreasing pool of resources”.

**Class A foam concentrate supplied through CAFS enables more efficient use of resources, which has led to an increase in Class A foam use within fire services.**

Compressed air foam can be pumped over large distances, due to the use of pneumatic pressure rather than hydraulic pressure. Station Manager, Chris Pratt, a CAFS trainer at the Academy added: “It is very important to emphasise the hazards of using pneumatic pressure to the students on courses as firefighter safety is always our top priority”. Ultimately one of the main benefits of compressed air foam to DSFRS is that it is a more efficient use of resources. The jet has a longer reach, approximately 20 percent further, which allows the crews to stand further back when they are defensive firefighting and therefore improving firefighter safety.”

Matthew Head recounted: “When I was on-station I attended an incident at a tyre remoulding factory. At the time of the incident the introduction of compressed air foam was in its infancy within DSFRS; only one watch in the city was trained in its use and many of the flexi-duty officers were unaware of its benefits. In the early stages of the incident a lot of water was used to try to extinguish this large fire, when in actual fact it was achieving nothing, particularly as we had difficulty getting water to the incident.” He continued: “The fire was well developed and was not going out with the water being applied so, after a discussion with the officer in charge, it was decided to try compressed air foam. The wet compressed air foam quickly soaked in and started to cool the pyrolising surfaces, the smoke disappeared and visibility improved”. Once compressed air foam was deployed, around 50 percent of the fire had been extinguished in roughly ten minutes and, at this point, the watch had been there for well over two hours.

At this particular incident the eight pumping appliances had delivered nearly 400,000 litres of water in over two hours of fire attack. The single compressed air foam unit extinguished the fire using 2,200 litres of water and 11 litres of foam concentrate in a fraction of the time. It is important to stress that compressed air foam is not right for every incident; it is another tool for firefighters to use in the correct situation supported by robust policy, procedures and quality training.

From 1st April 2011to 31st March 2012 DSFRS attended 762 vehicle fires (vehicle fires account for only 14 percent of all fires attended in that time period). If crews had used water only at these vehicle fires then approximately 1,143,000 litres of

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water would have been utilised. With water use, traditionally, there is about an 80 percent run off, which contains diluted toxins that disappear down the drain. In that same time period, if compressed air foam had been used exclusively using DSFRS procedures those same vehicle fires could have been extinguished using just 22,862 litres of water.

With car fires in particular the principle when using compressed air foam is that all of the firefighting media should be contained within the vehicle. Matthew Head explained: "As a fire service we are trying to encourage innovative, safe and efficient techniques that challenge the traditional techniques we have always used. We are learning from our experiences operationally and have been feeding this back into our training".

Anyone wishing to train in compressed air foam would need to make a strategic decision as an organisation as to whether they would like to go down this route. The importance of having the correct training is that compressed air foam uses pneumatic pressure rather than hydraulic pressure and there is a risk involved in that. If an organisation does make the decision to use compressed air foam there is an initial investment involved including training, the Class A concentrate, the CAFS itself and smaller fire engines if required.

With compressed air foam, smaller volumes of water can be carried on fire engines meaning that the media is being used much more efficiently. Therefore a small appliance has the firefighting capability of many fire engines, which enables more efficient use of resources. The benefits of smaller fire engines include less weight due to the size and the smaller amount of water needed. Better access can also be gained to incidents in places like Hong Kong, for example, where the roads are narrow. Much smaller fire engines would be of great benefit with regards to ease of access to incidents and would cut the response time greatly.

Recently, Wicklow County Council in Ireland pleaded guilty to safety violations and was fined €3 million. Firefighters Mark O'Shaughnessy and Brian Murray died at an incident where compressed air foam was used incorrectly in 2007. Mr O'Shaughnessy and Mr Murray entered the disused ink factory with compressed air foam and had to be rescued when they did not respond over the radio. Two other firefighters attempted to rescue them using a 'pulsing' technique with the compressed air foam; however, it failed to work in the way they expected and had no effect. It became apparent during the hearing that they not been given hot fire training using compressed air foam. This incident clearly highlights the importance of receiving the correct training and having robust policies in place.

The Training Academy backs up its compressed air foam training with a vigorous policy, highlight-

**A major benefit associated with using compressed air foam is that the water usage is greatly reduced. When water is used at fire related incidents, around 80 percent of this firefighting media is lost in run off, which ultimately can be full of contaminant. This can end up washing into surface water drains and other water supply systems. Another advantage of using compressed air foam is that the hose lines are around 60 percent to 70 percent lighter.**

ing that the service is not moving away from fire behaviour techniques and that compressed air foam is just another useful firefighting medium to be used in certain instances. It is also evident from the County Wicklow case that compressed air foam training needs to be provided for different types of firefighting incident scenarios. Chris Pratt pointed out: "If our crews decide to take a compressed air foam branch in to a compartment fire they must have a safe system of work that is gas cooling, with water at the right droplet size and at the right pressure".

The Academy is an Institution of Fire Engineers and Edexcel-accredited training centre. The DSFRS Academy has designed a day-long course for Class A foam. It touches upon operation and focuses on the hazards and risks involved as well as the theory behind the application of Class A foam at different incidents. The Academy is in the process of building a thatch training rig, which will look at how compressed air foam can be best used at thatch incidents.

The Academy is currently looking into utilising a car that will be used to simulate vehicle fires. The Training Academy CAFS courses can be tailored to suit individual needs. Compressed air foam refresher training is available and the Academy instructors are happy to offer advice if needed. DSFRS has gathered a large amount of evidence-based information, data and case studies, policies and risk assessments through using CAFS operationally and for training for the past 15 years. The Academy can offer the Class A and Class B foam courses. APF

**Jessica King** is Training Academy Commercial Support Manager at Devon & Somerset Fire & Rescue Service

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# Hotel Fire Safety is more than Detection

**Beat Schmid**

Siemens Building Technologies Division

Ensuring the safety of guests is a fundamental requirement for all hotel operators. Apart from the obvious threat to the lives of hotel guests and staff, fire can cause damage that risks the brand values of the hotel and destruction of the building caused by even the smallest fire. The harm to the hotel's reputation might be even greater and take longer to repair.

The installation of an inadequate fire system might well bring the unwelcome nuisance of false alarms. The disruption when alarm sounders ring unnecessarily or when full-scale evacuations are wrongly undertaken can have a lasting and damaging effect on any hotel's business. So, hotel operators need the assurance that the hotel is safe and well protected through the implementation of a reliable, integrated fire protection system that offers the earliest dependable detection, along with timely evacuation concepts and clearly defined escape routes.

## Fire Statistics for Hotels & Motels

Statistics show that perhaps fire safety needs to be given greater priority by some hotel owners. An average of one in every 12 hotels in the US reported a fire every year and an estimated average of 3,700 structure fires in hotels and motels is reported annually, resulting in yearly loss of 12 lives and injury to 143 people. 12 percent of fires are said to have begun within guests' rooms, accounting for 72 percent of the deaths of guests and staff. Smoking materials have been found to be the cause of fire in 79 percent of these deaths. In the USA alone, the cost of damage to hotel property averages around US$127 million every year.

## A Safe & Pleasant Stay

Fire prevention in any hotel should involve ensuring the installation of adequate fire detection systems in guests' rooms, public and 'back-of-house' areas, as well as implementing safe working practices in high-risk areas such as the kitchen. According to statistics, cooking equipment is involved in nearly 45 percent of all fires. However, guests need to know that they will enjoy their stay, and this includes the guarantee of a good night's sleep

without interruption by a ‘false’ fire alarm. False alarms are disruptive and irritating but, more importantly, they undermine the credibility of any genuine alarm. Any detection system needs to be accurate, reliable and ‘intelligent’; capable of detecting the earliest stages of a smouldering fire. It must also be capable of differentiating steam from smoke and other deceptive phenomena.

The protection of guests’ assets and valuables is important too, and this includes their motor vehicle. Therefore, hotel car parks should be covered by any fire protection system. Car park fires are capable of generating temperatures sufficiently intense to cause damage to even reinforced concrete structures. They should also be fitted with systems to detect, alarm and deal effectively with the build-up of carbon monoxide to protect guests from high concentrations of the gas.

## Fire Safety in Corporate Chains

Some operators find themselves faced with a dilemma, if they have limited capital to invest; spend more on protecting customers or make their hotel more appealing by investing in attractions and customer services? Or should they minimise expenditure to sustain competitiveness and maximise profits? This sometimes leads to the investment in fire safety standards to meet only the basic requirements of the relevant national legislation. Yet others rely heavily on the continued support of their corporate customers whose expectations are very much on the rise. As a result, many travel managers now insist on the highest safety standards, with 25 percent refusing to book rooms that do not have the highest standards of fire protection.

Global brands operating across multiple geographical locations face even bigger problems when dealing with fire safety. In different countries the implementation, use and maintenance of fire protection solutions will be stipulated by many different regulatory authorities. Simply keeping abreast of all the legislative advances of the different bodies, along with the constantly changing technologies, makes simple adherence to the appropriate standards difficult. The first challenge for international operators is to instigate sufficiently high corporate standards regardless of the national regulatory differences. The second is to ensure the full implementation of these agreed standards widely and consistently across every hotel.

However, despite the differences in national laws and standards, the majority of global hotel chains have adopted corporate fire safety schemes based on automatic detection and alarm schemes. Although these may be configured differently or contain different component devices, they all offer significant benefits in terms of speed of detection, response and orderly evacuation.

## The human Factor

One factor is common to all emergencies that is constant yet still unpredictable – human behaviour. With the sounding of a fire alarm, many people react with indifference. The ringing of an alarm bell siren is all too common and rarely demands the response of everybody who can hear it. Very often people ignore the alert, thinking it a test procedure or a ‘false’ alarm. Rarely is peoples’ first reaction one of clear understanding, calmly followed by a rapid and appropriate response. Too frequently the reaction is one of surprised but ineffectual attention, as people look for some kind of clarification or confirmation that the alarm is genuine.

Hotel guests are usually in unfamiliar surroundings where, at best, they have only a rudimentary knowledge of the layout or even the location of the nearest emergency exits. Few will have acquainted themselves with procedures, escape routes or assembly points that the hotel will have put in place. Guests may also have differing degrees of mobility, sight and hearing abilities. Most alarms in hotels happen in the early hours of the morning – 23 percent of fires in guests’ rooms occur between midnight and 2am – while people are asleep and initially disorientated when woken abruptly, so these factors are part of the challenge that fire safety engineers continually face.

## Learning from Other Industries

Hotels will generally have organisational measures in place to deal with fire alarms. These will range from the simple nomination of fire officers among staff to the most detailed guidelines for any possible evacuation. However, personnel measures alone cannot be relied upon to address all the critical needs for a successful emergency evacuation.

The use of technology instead to overcome the 'human factor' in the fire safety challenge, has an increasing role to play. It is an area where the hotel industry can learn from other industries to ensure efficient incident management. In most airports and on most university campuses, there are invariably large numbers of people – sometimes scattered over large areas and throughout several locations in numerous buildings. However, before extinguishing, firefighting or other intervention activity can take place it is sometimes necessary to ensure that everybody has been successfully evacuated. The difficulties involved in securing a complete and successful evacuation in any of these situations include the need to ensure that everybody knows exactly what is going on and what to do, while receiving all relevant updates pertinent to their individual position, in order to do so.

## Move from Simple Fire Detection Technology

One way that these other industries are tackling the issues is by putting in place solutions that enable response processes to be automated. It is becoming increasingly more common for fire detection systems to be integrated, not only with extinguishing systems but also emergency lighting, voice alarm and mass-notification systems as well as building management systems – to control smoke extraction, fire doors and lifts in the course of any potentially life-threatening event. Such integrated systems will automatically provide clear, step-by-step instructions for what to do, with whom to make contact, where to seek escape and where to assemble. All relevant alarm or lighting systems will be triggered automatically, so that every party involved knows exactly what to do next.

With regard to communicating with participants in an emergency, the focus is currently very much on mass-notification. By utilising the "connected" culture of today's mobile phone, messaging and Internet networks, it is possible to put plans in place to direct almost instantaneously as many people as possible to safety in any emergency. This means that the consequence of any outbreak of fire or any other incident can be minimised, not only in terms of injury or fatality, but also with regard to commercial disruption, both short and long-term. This means that reputational damage can be minimised too.

Although this level of integration is not usual yet within the hotel and hospitality industry, the technologies in common use could be put to far wider – and more vital – use. The latest flat-screen digital TVs and wireless connectivity now common in many hotels around the world, could provide the facility to implement a more holistic approach to incident response. Both would increase the likelihood of guests and staff receiving relevant information and instructions concerning any fire or incident and would have the financial benefit of utilising existing equipment without incurring the cost of additional resources. By following the lead provided by others, making smarter investments and making better use of existing technologies, the hotel industry can integrate all its fire, safety and security disciplines to make better provision for its guests' care and comfort.

## Intelligent Response for Best Protection

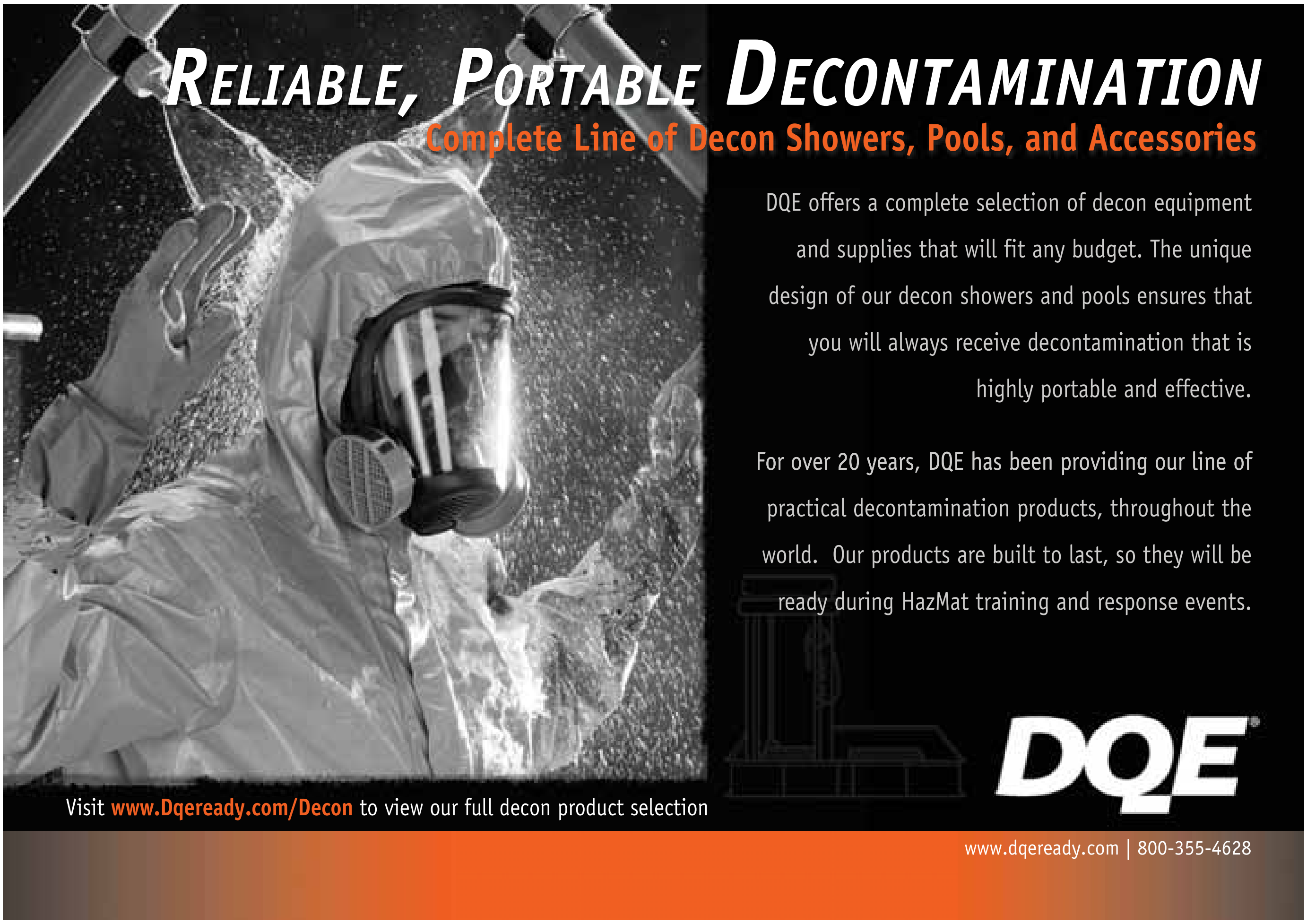
Today's integrated systems or solutions can prove even more invaluable. They are based on a rule-based approach, which determines the outcome based on information received from input devices such as fire detectors, intruder alarms and other systems. By adopting an approach whereby building technologies such as the heating, ventilation and air-conditioning systems, along with fire and intrusion detection and video surveillance are integrated on a common platform, different, predetermined responses will be triggered by different events. They involve a variety of integrated detection and communication technologies that are able to interoperate and work seamlessly together to ensure that guests, regardless of their location can be contacted and guided swiftly and efficiently to a place of safety. They also facilitate the on-site communication of the emergency services to help the firefighting, rescue and medical teams contain the incident and limit its effects and repercussions.

The solutions provided by today's leading manufacturers offer the hotel industry: early and reliable detection of fire in order to protect lives and limit the damage to properties; flexible and optimal adaptation to any hotel's building structure; tailored solutions for every part of the hotel; fewer false alarms caused by deceptive phenomena such as cigarette smoke, steam, exhaust fumes, kitchen fumes and sparklers; orderly and efficient evacuation if ever necessary; with fast and efficient installation with no interruption of everyday operations.

In short, today's leading solution providers now have even better ways to offer hotels and all their guests, staff and assets, real protection against fire – anywhere in the world. **APF**

**Beat Schmid** is Head of Product Management Fire Mass Market at Siemens Building Technologies Division

For more information, go to www.buildingtechnologies.siemens.com



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*A Hughes MD4 inflatable decontamination shelter in use*

# Decontamination – Making the Right Choices

**Andy Whitehead**

Hughes Decon Systems

Decontamination shelters have evolved to keep pace with potential threats and to extend the range of applications. It is important to make the right choice of ancillary equipment as well as the shelter itself to ensure optimum performance and maximum flexibility.

Responding to a Chemical, Biological Radiological, or Nuclear (CBRN) incident invariably means providing some form of decontamination.

As the potential threats increase and the hazards faced by the emergency services grow ever more complex, manufacturers of decontamination equipment have responded with a choice of solutions and specialist equipment optimised to suit specific applications. Saving life is always the priority and therefore a prompt response is essential. Decontamination involves washing potentially harmful substances from the body, and for emergency service personnel this may also include protective clothing and equipment. In principle, the process is straightforward and involves the use of a shower, either fixed or hand-held.

## Developments in Detergents & Chemicals

Adding detergents and other chemicals to the showering water may help to speed up the removal of specific contaminants or simply improve the overall effectiveness of showering. With traditional detergents and chemicals used for decontamination the emphasis has been on high dilution combined with soap/detergent solutions that in some cases can be a problem with insoluble contaminations. To address this problem with more practical knowledge and collaboration with chemical specialists and the introduction of new protocols, manufacturers can offer a more targeted approach. This can reduce run off waste by 90% and reduce time by 50%.

## Development of Decon Structures

Speed of deployment is obviously critical in emergencies, so weight, portability and ease of erection are important considerations. Stability is also essential together with a high level of reliability. Shelters need to be able to withstand repeated use in harsh conditions, during training and actual deployment, without sustaining damage that would take them out of service for repair.

Early shelters focused on the needs of the emergency services, providing a portable showering system that could be quickly erected at an

*A mobile air conditioning unit can enhance and extend the performance of shelters*

incident and used to remove contaminants from protective clothing and equipment.

As the threat from terrorism intensified, attention focused on mass decontamination and the possibility of having to treat hundreds or even thousands of casualties in the shortest possible time. In many instances, at least initially, this was achieved by simply scaling up the emergency units.

Manufacturers then addressed the specific needs of decontaminating large numbers of the public. Multiple channels through the shelter mean that male and female casualties can be treated simultaneously, passing along parallel channels separated by modesty screens. The internal partitioning in any shelter should be easily repositioned to ensure maximum flexibility – for example, providing separate channels for walking and stretcher-borne casualties. Different authorities have their own preferences based on local conditions, cultural needs and the nature of perceived threats, so this level of flexibility is essential for any type of shelter. Increasing the size of the shelter also provides additional space to accommodate two- and three-stage decontamination where the addition of chemicals and detergents to the initial wash water can improve its effectiveness.

Decontamination shelters are either inflatable or have rigid frames. For both, the emphasis is on stability, durability and speed of deployment. The end use remains the same; it is the materials and construction that make the difference.

### Inflatable Shelters

Shelters, such as the Hughes' Cupola range, consist of an inflatable frame with removable lining forming a stable and durable structure that is easy to erect. For safety an inflatable frame shelter should incorporate several separate sections so that, if it is accidentally punctured, the structure will not collapse on casualties or emergency service personnel. It is the same principle that applies to the design of life rafts and inflatable boats. Extensive testing has also revealed that contrary to what might be expected, glued and taped joints are far more durable and easier to repair than welded joints.

The ability to anchor the unit securely is also an important consideration as it may have to be used in adverse weather conditions. Although stability is the result of good design it also depends on the provision of secure anchoring points around the shelter so that it can continue in use during strong winds. The simplest and most effective is often strategically positioned guy ropes attached to the inflatable frame and secured by stakes driven into the ground.

Effective containment of contaminated wash-off is also important. While requirements relating to discharge into sewers will vary depending on local regulations, good practice dictates that all shelters should provide some form of sump to store the waste water until it can be collected and safely disposed of. With inflatable shelters this can be supplied as an integral part of the base of the unit so that when the shelter is inflated it is already in place. Raised flooring is necessary, allowing water to drain through into the sump and prevent casualties standing in potentially contaminated wash off. This is invariably made from interlocking non-slip modular panels, in part for ease of storage and transportation but also to accommodate different shelter sizes and configurations.

Ideally, all shelters, inflatable or rigid framed, should be positioned on level ground. In practice, however, this is not always possible, and working on a slight incline can soon raise the level of water at one side of the shelter above the top of the floor panel. When approaching suppliers, it is therefore advisable to seek out the deepest possible floor panels to take account of any variations in water depth in the sump.

### Rigid Frame Shelters

Although this type of shelter in various forms has been in use for a while, concerns have been expressed about portability, ease of erection and long term durability. Versatility is also increasingly important as emergency services try to maximise their investment in shelters to accommodate the growing range of applications. It is not economically viable or logistically desirable to carry a multitude of bespoke shelters.

The latest generation of rigid frame shelters, such as the Hughes' Articulating Rapid Deployment (HARD) Shelter, successfully addresses these issues. Now, with no need to compromise, rigid shelters are becoming the preferred choice.

Firstly, lighter and stronger materials are used. In the shelter, the T6 aluminium frame is derived from materials used for mountain bikes, giving exceptional strength for its weight and good shock resistance. Neoprene-coated Nylon for the shelter covering draws its superior properties from many years research into lightweight water-proof clothing. The result is a lightweight shelter that is easier to transport and assemble, robust enough to withstand rough treatment, even in the most testing conditions, requires minimum maintenance and lasts longer.

Ease of assembly is critical. The Hughes solution, for example, employs a single articulated frame that two people can erect and have ready to use in just two minutes.

If a rigid frame system as well as inflatable has an interchangeable liner this immediately extends the range of applications. With one standard shelter and a selection of liners, users can easily switch applications from decontamination shower to forensic examination tent, command and control facility or even a field mortuary. Insulation can increase the versatility even further, ensuring the shelter is equally effective in extreme climates. Depending on the application, air conditioning is also an option worth considering particularly for hot climates and when the unit is used as a temporary mortuary.

Whether opting for an inflatable or rigid frame system, it is important to choose a range of ancillary equipment that will optimise performance, extend the range of applications and provide a measure of self-sufficiency that may be critical when working in remote places.

## Ancillary Equipment

Understandably, the generator is often the first piece of ancillary equipment that operators consider.

Ideally, all electrically-powered equipment should have a 'low energy' rating. Reducing the power consumption of ancillary equipment such as lights and pumps has led to the use of smaller generators ranging from 2kW to 6kW depending on the load. In addition to energy savings, generators can be smaller and lighter making them more manoeuvrable, quicker to deploy and easier to transport, especially by air. A further development is the availability of flexible solar panels that can be fitted to shelters when they are used over longer periods, such as in search and rescue operations.

However, such reductions must not be at the expense of endurance and reliability, which is particularly important in remote locations. The size of the fuel tank on the generator can be significant and best practise suggests an ideal capacity to give at least eight hours of uninterrupted power supply.

High quality lighting inside and in the immediate vicinity of the shelter is also essential for efficient and safe operation and ensures that it can be used on a 24-hour basis. Externally, low energy flood lights are the ideal choice and these can usually be supplied on telescopic columns to provide sufficient height for directing the light to flood the working area. Also consider lighting with battery back-up, as this offers even greater flexibility and a measure of independence from the generator. In addition to external lighting, this type of light can provide sufficient illumination for the interior of shelters if they are fitted with a white translucent cover. It is something to keep in mind when discussing requirements with your shelter supplier. Shelters with darker covers, such as military camouflage, will, of course, need additional interior lighting units which, on rigid shelters, are normally clipped into position on the overhead frame.

## Breakthrough in Portable Air Conditioning (AC) Units

It is important to maintain an acceptable temperature and air quality within the shelter or decon system. To some extent this will depend on the external ambient temperature range, but the role of the shelter is also an important factor. The temperature for a temporary mortuary, for example, should be no more than 4°C and a shelter used for decontamination may need forced ventilation to stop dangerous gasses or vapours building up inside.

*A mobile infection control unit incorporating chemical additives in the shower water*

New lower energy mobile ac/heaters can be positioned alongside the shelter to feed temperature-controlled air through a recirculation flexible ducted system. This can be either cool air for hot climates or switch over to heated air as required.

## New Levels of Containment

Emergency decontamination showers obviously require a water supply and way of removing the wash water. Low energy pumps are available to transfer the water to and from the shelter. Portable heavy-duty reservoirs can provide temporary water storage for showering, while contaminated clothing, equipment and waste water is best stored in collapsible palletised receptacles that can be transported by pallet truck and then stored flat taking up minimum space on rescue vehicles or in the warehouse. For the reservoirs, 5000 litres or 6000 litres are a practical capacity.

As already discussed, the use of chemical additives to the water can significantly improve the efficiency of decontamination showering and has the added advantage of reducing the amount of water required. The resulting reduction in waste water volumes opens up the prospect of more efficient methods of waste management by using environmentally beneficial filtration or recycling techniques.

## Conclusion

While considering the merits of inflatable and rigid frame shelters, it is the availability and suitability of ancillary equipment that may eventually determine which route you take. With the latest technology and the benefit of user feedback, manufacturers have refined their products to provide a much more targeted approach that delivers optimum performance for specific tasks while retaining flexibility in deployment to enable you to make the most of your investment. **APF**

**Andy Whitehead** is Decon Manager at Hughes Decon Systems

For further information, go to www.hughes-safety-showers.co.uk

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**Neil Bibby**

# Who Should Run This Fire?

I have, for many years, had concerns with seeing the chief fire officer or one of his deputies, in full firefighting gear, on television news at the scene of a fire. I also know that if the most senior officers are in attendance, there will be three or four other senior people in attendance as well. Let us think about this and I generalise because there are many variations on this theme. However, they all come to the same point – do we not trust our field officers to do their job?

This is not the waffling of a grumpy old chief (some may differ) but reflections while sitting back in retirement and, may be, realising I was part of the problem too.

My fundamental question is: why do we have so much brass at a fire?

First let us look at the excellent training now undertaken by all first line officers. In advanced countries of the world (notice I did not say "in the western world" this is because many Asian fire services are more advanced than those in the western world) most junior officers, after five years in the field, go through significant training and examinations to show that they can handle a fire of at least third alarm (small factory, six to eight appliances and crews); more to the point there could be six officers of that calibre at the scene.

The equipment in this modern era provides fire officers with a greater knock-down capacity than could have been imagined in the past; a fire appliance has two or even three times the capacity of three decades ago while also utilising fewer personnel. This means most medium size fires are under control or contained very quickly. In a large number of cases the senior officer response has not changed from the 1970s when equipment was more basic and required larger numbers of firefighters to bring them under control. After the first wave of appliances had arrived and set up, other fire appliances arriving were just people transports to the fire.

Normal practice is for a battalion chief/district officer (DO) to drive through the streets "code one" and arrive just as the flames are dying down,

Why? It is a different story if the officer on scene requests back up. However, normal custom and practice is to send in a more senior person, whether they are needed or not.

The above scenario is for the smaller fires and utilises on-shift personnel; it becomes more of a problem when senior staff are dragged out bed from home and again drive through the streets "code one" for a medium to large fire. As I mentioned above, there is already a DO on scene and if the job has been sectored correctly you will have an officer in charge of each sector, with crewing well within his or her capability. Why is there a need for additional senior staff that could be seen as overkill?

There will be times that, for political, media and/or agency purposes, you will need senior people at the scene of a fire and, for the once-a-year very large fire, senior people to run the fire. But what message are you giving junior officers if every time there is a smell of smoke (exaggeration) they are out-ranked, and where do they get their experience if they are relegated to running hose? This, in effect, is perpetuating the problem, junior officers do not get experience, therefore justifying the response of senior officers, which stops them from getting that experience.

Would it be too crass to say that some senior people cannot let go of the adrenalin rush of speeding to a fire so they can talk about the flames and smoke over the water fountain the next day?

Senior officers are running the business of the fire service, training, prevention, operations and human resources to name but a few. All these positions are usually full-on jobs with diaries backed up for months. However, it has become an accepted norm for a phone call that goes something like this: "we have to cancel the meeting this morning because Assistant Chief Smith was at the factory fire last night". The six people at that meeting now cannot get on with what they have to and re-schedule the meeting, usually weeks away to get everyone's diaries lined up again. An alternate to this is coming into work after being up all night and making sleep-deprived decisions, remembering that lack of sleep is equal to excess alcohol consumption.

The other observation is that this is only a function of inner city fire agencies. If you compare the same 4th alarm fire (eight to twelve appliances) in a rural town and an inner city suburb you could find a divisional office in the city being in charge while in the country a volunteer captain is in charge. In this case, distance and time make it impractical for a more senior officer to respond, and if a senior officer has responded it is usually only one, and not all of headquarters.

Now take into consideration the difference between structure fire and wildfire. Although wildfires are usually more dynamic, larger and more destructive, you will not see the equivalent of an assistant chief running around in turnout gear giving orders; you will see the appropriate rank managing what they are trained to do, with crews numbers they are capable of handling. Why is a building fire different?

Let us look at the ten main reasons that senior officers have given to me to rationalise them attending fires that, I think, could have been handled by less senior officers.

### 1. Supporting the junior officer

If every officer needs support you are running a poor fire service and you have wasted the millions of dollars you have spent on training, infrastructure and courses.

### 2. Keeping my hand in for the big one that comes along

You do not have to attend a fire to do this;

how about attending a few refresher exercises? Senior officers are often too busy to attend (different if there is smoke) and how is the junior officer going to get experience if he or she is always out ranked? Secondly, how often do you actually make a decision that matters when you arrive?

**3. To deal with the media**
Do not be a "show pony" – young officers are more than capable of doing a thirty second grab to air and if they are not, have a look at your training programs to include media training.

**4. The fire has political implication**
Yes, acceptable, but not with five other senior officers. Also look at your colleagues in the police force. When does the police commissioner or assistant commissioners attend a major event like a terrorist bombing? Never, he or she is well briefed for the press conference that afternoon or the next day.

**5. I enjoy going to fires**
Grow up!

**6. It is a very big fire**
Review your standard operating procedures to ensure the appropriate rank that is needed attends, not the rank that wants to attend. A major issue at large fires is the handover of control at the change of shift and arrival of a more senior officer. We train and practice handovers because this is where mistakes can be made if the in-coming officer is not briefed fully on all issues of resourcing, risk and strategies. Increasing the number of handovers adds significantly to the chances of something important falling through the cracks. I have personally seen four handovers in one hour at a large event, in hindsight (a great learning tool if you use it correctly), a disaster waiting to happen.

**7. It is a community expectation**
The community have only one expectation and that is that the fire goes out and no one is hurt; they could not care less who is on scene. The only members of the community that will care are your personal community; friends, colleagues and family; are they who you are pleasing?

**8. I attend but do not take charge, so I can assess how the crews are operating**
As the senior ranking person in attendance you are in charge (responsible) for anything that happens at that fire, not taking charge does not move that responsibility on to someone else. At the blink of an eye you can countermand any order. The assessment of crews is still a legitimate reason but make it part of a formal procedure not an excuse to turn up to all fires that occur near your home.

**9. The incident may escalate and it is better to have the team in place or I remember when an event escalated and thank goodness we were here**
We work in the emergency services and all incidents have the potential to get bigger, if you take that to the extreme, senior officers should respond to every rubbish bin fire . . . just in case. I say that to make my point; we do not know when things are going to get out of hand. A well trained officer will know when to ask for help and if he or she does not then look at your training. As for the "thank goodness we were here", think honestly how often this occurs, if ever, and if it occurred while you were there, maybe you were part of the problem and/or your presence did not stop the escalation.

**10. The tenth and last one is the justification of the number of senior officers in the agency**
You know the argument, we need X number to be on call therefore we need X plus to have a 24/7 response capability, therefore we cannot have civil servants or matter experts doing this job because we need the rank numbers. In these days of tight belts you need to make sure the senior group is justified on real need before you cut the lower ranks. An example of this would be in the training, logistics and human resources disciplines. How many services still have a uniform person in charge of these areas instead of a matter expert? Does it really need a uniformed person looking after the vehicle fleet?

Now, after having my rant, I accept that there are times when senior people may be required, needed and/or essential at an incident, but this should be the exceptionand not the rule. Have faith in your junior officers, they are the ones you have put most of your energy into and trained to do the task. If they cannot do the job, do not cover it up by overkill. Solve the problem so they can cope. Or are you part of the problem?

In summary, we all know the theory behind command and control. We spend millions in training our people and equipping them with the best technology we can afford, so let us get the systems right for this modern era and not be tied down by the customs and practices of the past. APF

**Neil Bibby** is Managing Director of Vector Command. He was Chief Executive Officer of the Country Fire Authority between 2002 and 2009

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# Assessing Toxic Emissions at the Rural/Urban Interface

**Fabienne Reisen**

Bushfire CRC and CSIRO Marine & Atmospheric Research

Forecasted population growth in rural/urban interface areas will expose more residents and homes to an increased bushfire risk. As a result, fighting bushfires at the rural/urban interface is likely to become more frequent, but currently little is known about the air toxins emitted and exposure concentrations inhaled by firefighters and residents.

The rural/urban interface is characterised by multiple fuel types, including vegetation, as well as a range of combustible materials from house structures, house contents, vehicles and other objects around a house. These burning materials are likely to emit additional toxic combustion products, and as a result may cause a greater health risk to firefighters and community members in the vicinity of the fire.

Tests on a small scale have been conducted on a range of materials present in buildings to assess the type and yield of a range of emission products. Furthermore, large scale fire tests have been conducted to assess emissions from car fires and fires within a specific room. A review of the existing literature has revealed that organic compounds were considered to present a potential health hazard, but in most studies individual compounds have either not been identified or quantified. Although total emissions of carbon monoxide (CO) and carbon dioxide ($CO_2$) dominate, hydrocarbons and volatile organic compounds are important contributors to the total emissions, and therefore likely to impact on health.

## What Research Has Been Done?

Experimental burns were conducted using a cone calorimeter, which is a small-scale fire test apparatus that aims to determine heat release rate, mass loss rate, ignitability, gas species and particle production rate. Specimens sized 100mm by 100mm of various building types and furnishings were

*Figure 1* ***Emission factors (mean + standard deviation) of carbon monoxide (CO), carbon dioxide ($CO_2$) and total carbonyls***

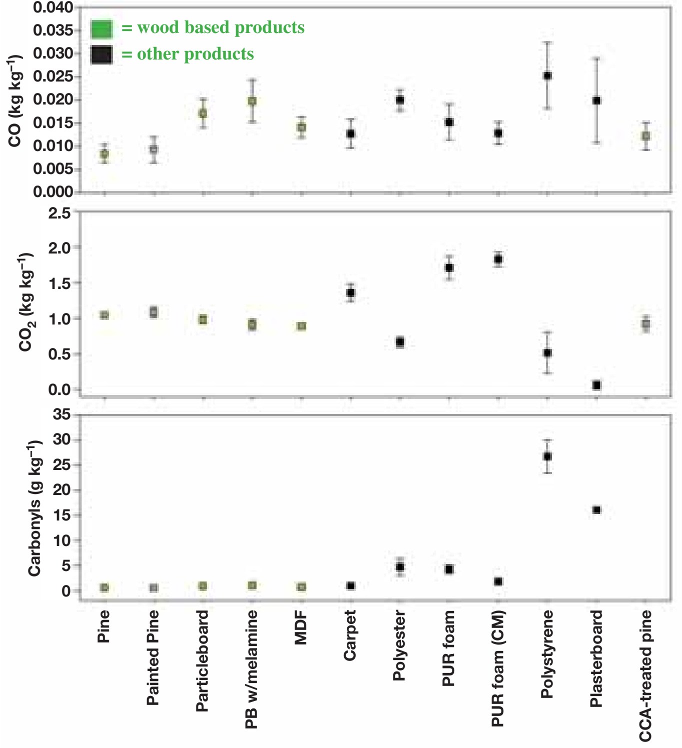
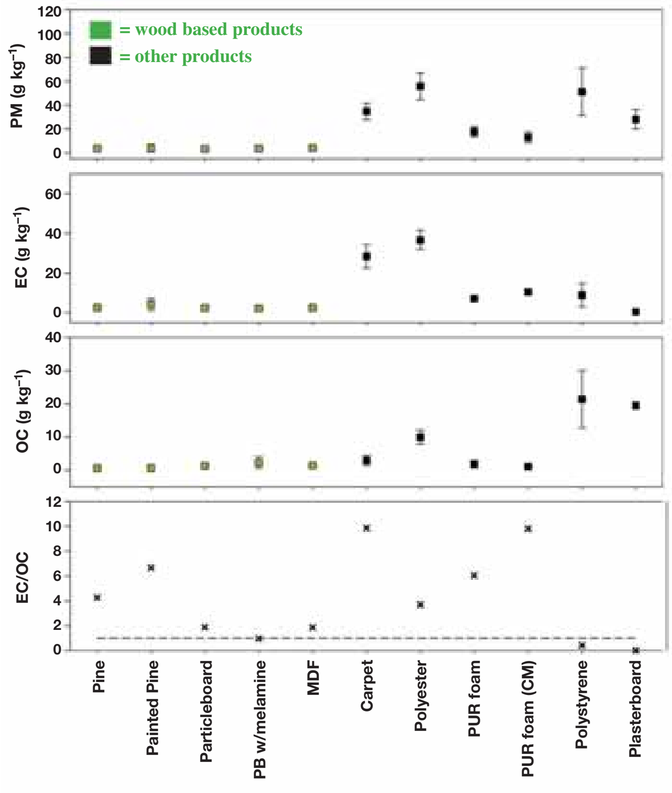


*Figure 2* ***Emission factors (mean + standard deviation) of particulate matter (PM), elemental carbon (EC), organic carbon (OC) and EC/OC mean ratio***



conditioned at 23°C and 50 percent relative humidity. The specimens were then placed into a sample holder and subjected to a radiant heat source of 25 kW/m$^2$. The tests were conducted in well-ventilated conditions with constant air supply fed into the system. The gases passed through an exhaust duct, which was lined with two sampling inlets. These were linked to a number of sampling devices to collect a range of gaseous species and particles.

A desktop study on toxic emissions from fires at the rural/urban interface has shown that wood and wood-based products make up the majority of materials burnt, followed by polymeric materials. As such, the materials tested in the experimental burns included a number of wood-based and polymeric products commonly found in furnishings and home contents. Most of these materials were predominantly made up of carbon, oxygen and hydrogen. Because of this, their major emissions are $CO_2$ and CO. However not all of the carbon is converted to $CO_2$ and CO; the carbon that is not is released as aliphatic, aromatic and oxygenated hydrocarbons, some of which have the potential to harm people's health.

Some of the materials such as particleboard, medium-density fibreboard, carpet and polyurethane foam contain a significant fraction of nitrogen. Burning these materials will produce hydrogen cyanide, ammonia, nitriles and nitrogenated hydrocarbons. All of these are potentially harmful to people's health.

Emissions from all materials tested were evaluated against those from pine, a natural material widely used for structural construction. For this reason, it is a good reference material against which to compare manufactured and/or synthetic materials.

## What Has Been Learnt?

Initial findings from the experimental burns, as well as the literature review conducted prior to the tests, show that exposures to compounds emitted during combustion of materials can lead to a range of adverse health impacts. These can be classified as follows:

**1** Asphyxiants (CO and hydrogen cyanide).

**2** Irritants (particles, volatile organic compounds, carbonyls, nitrogen dioxide, ammonia, hydrogen chloride and sulphur dioxide).

**3** Impact on the central nervous system (CO, benzene, toluene, phenol).

**4** Carcinogens (benzene, formaldehyde, naphthalene, isocyanates).

Some of these toxins, in particular chlorinated and nitrogenated compounds, are likely to be more present in bushfires at the rural/urban interface due to the types of fuels and materials burnt when compared with a forest bushfire. Other air toxins such as CO, particulate matter, formaldehyde and benzene are major air toxins emitted from both rural/urban interface and forest bushfires.

The results from the experimental burns are summarised in Figures 1 and 2, which show the emission factors (defined as the amount of a compound emitted per amount of fuel consumed) of CO, $CO_2$, particulate matter, elemental carbon, organic carbon, and the elemental carbon to organic carbon ratio for 11 different types of combustible materials. Figure 3 shows the total carbonyls for these same materials. Results from a previous study that measured CO and $CO_2$ emissions for CCA treated pine are included as a reference in Figure 1.

## Carbon Monoxide

The highest emission factors of CO were observed for polystyrene, followed by plasterboard, particleboard with melamine and polyester (Figure 1). In comparison, pine recorded the lowest emission factors.

## Fine Particulate Matter

The highest emission factors of fine particulate matter were measured for polyester and polystyrene (Figure 2). Both materials emitted approximately 20 times more particles compared with pine, while carpet emitted approximately nine times more particulate matter than pine. No major differences were observed among wood-based products.

## Elemental Carbon & Organic Carbon

Wood-based materials were found to have the lowest carbon emissions, while polyester, carpet and polystyrene had the highest (Figure 2).

In general there was a larger fraction of elemental carbon compared with organic carbon. The exception was with polystyrene and plasterboard, where a significant organic carbon fraction was recorded. Lower elemental carbon to organic carbon ratios were also observed for manufactured wood products when compared with pine, with the difference likely due to the presence of glues and resins in the manufactured products. The organic fraction is likely to contain harmful organic compounds.

## Carbonyls

Carbonyls, a class of irritating volatile compounds, were emitted at highest concentrations during combustion of polystyrene, with emission factors for total carbonyls being 45 times higher than those for pine. Other materials with high emissions of carbonyls were plasterboard, polyester and polyurethane foams.

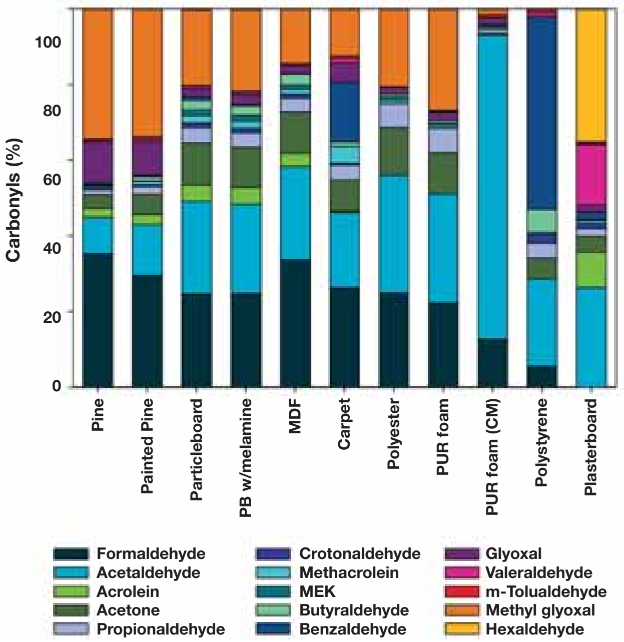
The relative distribution of individual carbonyls for each material is shown in Figure 3. It clearly shows, with the exception of polystyrene, that formaldehyde and acetaldehyde were the dominant carbonyls, contributing between 29 percent and 93 percent to the total emissions of carbonyls. Formaldehyde is a known human nasal carcinogen, while acetaldehyde is a possible human carcinogen. For the combustion modified polyurethane foam, acetaldehyde was the dominant carbonyl (80 percent). Both polystyrene and carpet had significant emissions of the strong irritant benzaldehyde. Acrolein, another strong irritant, was emitted primarily during combustion of wood-based products.

About two to four times the amount of emissions were observed for manufactured wood products compared with pine. A wide range of volatile organic compounds were identified during testing. These can have health effects that range from irritation of the eyes, skin, nose, throat and respiratory system, to headaches, dizziness, drowsiness and nausea, to being possible and known human carcinogens.

While a number of volatile organic compounds (benzene, toluene, styrene, xylenes, naphthalene, acetic acid and phenol) were present during combustion of all materials, others have only been identified during combustion of specific materials. These include pyrrole and nitriles, which were emitted during combustion of nitrogen containing materials only (particleboard, medium-density fibreboard, carpet) and pinene, camphene and limonene, which were emitted solely from combustion of wood-based materials. In general burning wood-based and polymeric materials released volatile organic compounds at higher concentrations than pine. As a result, the combustion of these products in fires at the rural/urban interface is likely to present a greater health risk than forest bushfires.

*Figure 3*

**Relative distribution of individual carbonyls emitted during combustion of various building and furnishing materials**



## How Could the Research be Used?

The research will provide a better understanding of exposure risks to personnel and communities during bushfires that extend into the rural/urban interface.

The emphasis for assessing this exposure risk is on inhalation – exposures that occur outside of burning structures at varying distances from the fire and the smoke plume. It is assumed that in most cases firefighters do not wear breathing apparatus and that the majority of firefighting will be done outdoors. This clearly distinguishes firefighting at the rural/urban interface from firefighting at structural fires.

The outcomes from the research can be used to inform training, work practices and appropriate use of personal respiratory protective equipment, as well as to assess the use of truck-mounted air monitoring devices and to provide advice on firefighter and community safety.

## Where to Now?

The emission factors determined during the small-scale experimental burns described in this article are not necessarily representative of all exposures firefighters could encounter. However, they do provide an important input into a high time-resolution dispersion model that will provide short-term modelled ground concentrations, resulting in a reliable estimate of potentially hazardous exposures.

Significant additional work is required to develop a useable set of scenarios and compare modelled exposure concentrations with previously measured exposures at structural fire incidents. Monitoring was conducted at structural training fires, which simulated room fires in three typical rooms (living room, bedroom and office). The results will provide data to validate outputs from the model. **APF**

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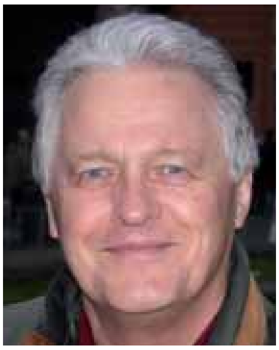
For more information, go to www.bushfirecrc.com

# Tell, Show, Do – th Effective ARFF Tra

*Photograph courtesy of Airservices Australia*



**Graham Collins**

Some of us learn most effectively by being told, some by watching a demonstration, and some by actually trying to master the task first hand. For most people though it is a combination of all three, and that is one of the guiding principles behind Airservices' new Aviation Rescue and Fire Fighting (ARFF) training facility at Melbourne Airport in Australia.

Major fire and rescue incidents at airports are, thankfully, rare but when they do occur the potential for major loss of life, expensive collateral damage and extensive disruption to service is very real indeed. So much so that airport operators around the world are constantly focused on ensuring that their ARFF firefighters are at peak performance and the equipment they use is the best available.

Nowhere is this more exemplified than at the new ARFF training facility at Airservices Australia's Melbourne Air Traffic Services compound at Melbourne Airport, where the service recently opened its new A$20 million Learning Academy Hot Fire Training Ground (LAHFTG), part of a A$140 million five-year investment to modernise ARFF facilities that also includes new firefighting vehicles and the refurbishment of fire stations.

This cutting-edge facility has been widely heralded as being the only one of its kind in the southern hemisphere, with the showpiece of the new training ground being a full-sized mock-up aircraft fuselage. This three-part, multi-level structure replicates the forward fuselage section of a double-deck, wide-body, four-engine Airbus A380 – the world's largest passenger airliner – a rear fuselage section of the wide-body twin-engine Boeing 767, and a tail section of the three-engine, wide-body McDonnell Douglas MD-11. It is 56 metres long, 10 metres high and 29 metres wide.

Together these three planes typify the aircraft currently using 22 of Australia's busiest airports where Airservices is every year responsible for traffic operations for over 80 million passengers on more than four million flights. This hybrid Large Mock-up Unit or LMU enables participants of the training facility to gain invaluable hands-on experience of firefighting and rescue operations involving today's large and complex airframes. At the touch of a button, the LMU can expose ARFF firefighters to a range of computer-controlled internal and external training scenarios including aircraft fires, fuel spills and engine fires.

The aircraft simulator and associated fire control and safety systems were designed, supplied and installed by Dräeger Safety Pacific. The 180-tonne steel LMU incorporates an array of realistic features, including life-like compartment configurations, passenger seating, door openings, accurately scaled engine nacelles, and a series of ground fuel spill fire scenarios. "Cosmetic" smoke can be pumped into the LMU to simulate life-like firefighting and rescue conditions.

The 15,000 square-metre Melbourne facility also incorporates new classrooms and vehicle engine bays. An externally located and custom designed HazMat storage area provides fuel and services supply for the simulator. Stringent environmental control systems are in place to minimise the impact of the training activity on the surrounding environment. The hard surface of the fire training ground forms the catchment area for contaminants for input to the training complex's waste water treatment plant for recycling and

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reuse. In this way, all foam and water used during training is captured and treated.

The new facility centralises what Airservices describes as: "the delivery of high-quality, realistic training to recruits and experienced firefighters undertaking required ongoing and advanced training." It complements an existing training facility at Melbourne, which is consistent with facilities at key operational stations, and a smaller LMU located at Airservices' Sydney Airport station, ensuring a high level of consistency in the training delivery.

To ensure that the training reflects the day-to-day operations experienced by the firefighters undergoing training, the facility is equipped with the latest vehicles and firefighting equipment utilised as standard by Airservices. This includes the Rosenbauer Panther (which Airservices refers to as a Mk 8 Ultra Large Fire Vehicle or ULFV). These ten-metre long, 30-tonne vehicles carry 8900 litres of water and 1340 litres of foam at a liquid discharge rate of 80 litres-a-second, which turns to foam, and can throw foam in excess of 80 metres from a forward roof-mounted monitor. They have a top speed of 120 kilometres an hour. The grey "box" on the roof – just behind the passenger side window – contains floodlights on a telescopic mast to provide area lighting. Stowage for various rescue and firefighting equipment is provided behind the roller doors on the sides of the vehicles.

## Training Programmes & Applicant Profile

While the facility is designed and equipped to deliver nationally accredited and recognised Recruit Certificate II, Certificate III, Certificate IV, Diploma and Advanced Diploma level training – all of which will be delivered in 2013/2014 – initial courses focused on the Recruit Certificate II intake. The facility is also delivering one-week operational workshops, which are refresher programmes.

To be eligible to undertake recruit training at the Learning Academy Hot Fire Training Ground applicants must be at least 18 years old, have Australian or New Zealand citizenship or Australian permanent residency, hold a Senior First Aid certificate or equivalent prior to commencing the recruitment course, and hold a manual driver's licence. If the candidate is applying for water rescue equipped locations, they must also hold a current water competency qualification, such as Bronze Medallion, or have the ability to undertake and pass an ARFF water competency assessment prior to joining the course.

The selection process is broken into a number of stages and involves online testing, a telephone interview and physical assessment that consists of a shuttle run (required level of 9.6), functional testing, and a series of physical aptitude tasks. Assessment takes place at a location of the applicant's preference and comprises a panel interview, a teamwork exercise and further online testing. Referee checks and a medical are undertaken before an offer of employment is made.

*Photograph courtesy of Airservices Australia*

Successful recruit applicants undergo 11 weeks of intensive training at the Melbourne Learning Academy prior to placement at their home fire station. In line with other Australian firefighters, they are trained under the Australian Public Safety Training Competencies. A base firefighter leaves the recruit course with a Certificate II Public Safety (Fire Fighting and Emergency Operations) in firefighting with the rank of Trainee Fire Fighter. Over the next few years they advance to the Leading Fire Fighter ranks and obtain a Certificate III in Public Safety (Fire Fighting and Emergency Operations) firefighting.

## Undergoing Training

The first step towards becoming an officer in ARFF is the Certificate IV in firefighting supervision which, on successful completion, holds the rank of Sub Station Officer. Station Officers and Fire Commanders in ARFF are qualified to Diploma of Fire Management. Senior Fire Commanders and above are qualified to an Advanced Diploma level.

All training takes the form of theoretical classroom sessions and practical exercises. The recruit Certificate II training, for example, comprises a number of units including accident prevention, responding to an urban fire, operating breathing apparatus open circuit, preparing, maintaining and testing response equipment, and working as a team. It also embraces providing emergency care, participating in rescue operations, operating communications systems and equipment, checking installed fire safety systems, working effectively in a public safety organisation, communication in the workplace, responding to wildfires, and responding to aviation incidents.

As part of the 11 week training programme, the Learning Academy Hot Fire Training Ground programme also delivers elements of the Certificate III training that comprises maintaining safety at an incident scene, undertaking road crash rescue, operating pumps, managing injuries at an emergency incident, and administering oxygen in an emergency situation. **APF**

Airservices Australia is one of the world's largest providers of aviation rescue and firefighting services. It employs more than 740 operational and support personnel and operates and maintains a fleet of over 100 specialised, high-performance aviation firefighting vehicles, aerial rescue vehicles, water rescue boats, difficult terrain vehicles and domestic response vehicles. On average, Airservices' firefighters are called out around 150 times a week across Australia's regional, domestic and international airports, responding to aircraft and airport emergency assistance incidents. Around 250 firefighters at all levels are expected to pass through the Learning Academy Hot Fire Training Ground facility each year.

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Email: sales@pacfire.com.au
Website: www.pacfire.com.au
**Dealer/Distributor**

**BANGLADESH**

### MANIK BROTHERS
Hai Mansion (3rd Floor)
9/3 Motijheel Circular Road
Dhaka – 1000, Bangladesh
Contact: Mr A K Bhowmick
Tel: +880 2 7100 589
Fax: +880 2 7100 386
Email: manikbrs@dhaka.net
**Dealer/Distributor**

**BRUNEI**

### YEN LEE FIREWELD PTE LTD
18 Penhas Road, 208182, Singapore
Tel: +65 62909890
Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
**Dealer/Distributor**

**FIJI**

### PHILLIPS & SMITH LTD
10 Akatea Road, Glendene
Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

**HONG KONG**

### CHUBB HONG KONG LTD
10/F Octa Tower, 8 Lam Chak Street
Kowloon Bay, Kowloon, Hong Kong
Contact: Simon Tsang
Tel: +852 2746 9736
Fax: +852 2627 6768
Email: simon.tsang@chubb.com.hk
Website: www.chubb.com.hk
**Dealer/Distributor**

**INDIA**

### FOREMOST MARKETING PVT LTD
M-1 Green Park Extn
New Delhi 110016 India
Contact: Mr Vinay Khanna
Tel: +91 11 261 969 82
Fax: +91 11 261 669 61
Email: foremosttechnico@gmail.com
Website: www.foremostsafety.com
**Dealer/Distributor**

**INDONESIA**

### PT INSPIRAN IDEAL INDOTAMA
Jl. Pejaten Barat No. 39, Pasar Minggu
Jakarta Selatan 12510
Indonesia
Contact: Lim Tiam Hwat
Tel: 62-21-7182472
Mobile: 62-816889164
Fax: 62-21-7182578
Email: lim@inspiran.co.id
Website: www.inspiran.co.id
**Dealer/Distributor**

**JAPAN**

### ABLE-YAMAUCHI CO LTD
Yokohama Nishiguchi, SIA Building
10-36 Kitasaiwai
2-Chome Nishi-Ku
Yokohama 220-0004, Japan
Contact: S Yamauchi
Tel: +81 45 312 1130
Fax: +81 45 312 1350
Email: emiko@able-yamauchi.co.jp
Website: www.able.yamauchi.co.jp
**Dealer/Distributor**

**MALAYSIA**

### DASAPREM (M) SDN BHD
10 & 12 Jalan Muara 8/9
40000 Shah Alam
Selangor Darul Ehsan
Malaysia
Contact: Mr Prem R Murthy
Tel: +603 550 9060
Fax: +603 550 4486
Email: dasaprem@yahoo.com
Website: www.dasaprem.com
**Dealer/Distributor**

**NEW ZEALAND**

### PHILLIPS & SMITH LTD
10 Akatea Road, Glendene
Auckland, New Zealand
Contact: Mr S Hampton
Tel: +649 818 8048
Fax: +649 818 4484
Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
**Dealer/Distributor**

**PHILIPPINES**

### 24 HR RESOURCES CORPORATION
602 A San Joaquin St,
Cor Sto Nino St Brgy
Plainview Mandaluyong City
1550 Metro Manila, Philippines
Contact: Romeo Espedido
Tel: +632 5311258
Email: sales.24hrirc@gmail.com

**SINGAPORE**

### YEN LEE FIREWELD PTE LTD
18 Penhas Road, 208182
Singapore
Tel: +65 62909890
Fax: +65 62961444
Email: jeffrey@fireweld.com.sg
Website: www.fireweld.com.sg
**Dealer/Distributor**

**SRI LANKA**

### FIRETECH (PRIVATE) LTD
34 Walter Gunesekara Mawatha
Nawala, Sri Lanka
Contact: Leon Daniels
Tel: +94 11 4410588
Fax: +94 11 2806666
Email: firetech@pan.lk
**Dealer/Distributor**

**TAIWAN**

### SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD
No 222-2 Sec2, Cheng Tai Rd
Wu-Ku Shiang, Taipei
Hsien, Taiwan
Contact: Liu Yuan Hung
Tel: +886 22292 1751
Fax: +886 22291 1984
Email: sheng.tai@msa.hinet.net
Website: www.shengtai.com.tw
**Dealer/Distributor**

**VIETNAM**

### TRAN VU TRADING CO LTD
61 Ban Co Street, District 3
Hochiminh City, Viet Nam
Contact: Tran Vu Hong
Tel: +84 88325101
Fax: +84 88309586
Email: sales@tranvufire.com
Website: www.tranvufire.com
**Dealer/Distributor**

## COLTRI ASIA PACIFIC

**BEIJING AND NORTHERN CHINA**

### BEIJING DEKANG TIMES SCI & TECH CO LTD

Room 211, Building Huixinxiangyuan
No.2 Beisanhuanzhonglu, Chaoyang District, Beijing
Contact: Miss Amy
Tel: 0086-10-62356354, 62352539, 62366379
Fax: 0086-10-62366364
Email: dekangtimes@hotmail.com
Website: www.beijingdekang.com
**Dealer/Distributor**

**CHINA**

### SHANGHAI PANNY TRADING CO LTD

3F, #17-2 No.230, Xinjinqiao Rd.
Pudong new area, Shanghai
Contact: Mr Todd
Tel: +86-21-50321062
Fax: +86-21-50321063
Email: todd@coltrisub-china.com
Website: www.coltrisub-china.com
**Dealer/Distributor**

**HONG KONG**

### WAH SHING COMPANY

No. 2B-2C, G/F, Larch Street, Tai Kok Tsui
Kowloon, Hong Kong SAR
Contact: Mr Danny Kwok
Tel: +852 2391 3997, +852 2391 4084
Fax: +852 2789 4638
Email: wahshingcompany@gmail.com
**Dealer/Distributor**

**INDIA**

### JYOTECH ENGG & MKTG CONSULTANTS

Corp. HQ: B-127, Sector 65, NOIDA – 201302,
Distt Gautam Budh Nagar, U.P.
Contact: Mr Chandan Bhatia
Tel: 0120-4711300
Fax: 0120-4711317
Direct: 0120-4711304
Mobile: 09811115979
Email: chandan.bhatia@jyotech.com
Regd Office: H-49 A, Kalkaji, New Delhi 110019
**Dealer/Distributor**

**INDONESIA**

### LAUTAN MAS

Jl. Toko Tiga No. 24 Jakarta 11230 Indonesia
Tel: +62 (0) 21 690-1333
Fax: +62 (0) 21 690 2479
Email: info@lautanmas.com
Website: www.lautanmas.com
**Dealer/Distributor**

**KOREA SOUTH**

### DONG-JIN ENGINEERING CO LTD

Gwansan-Don 570, Deokyang-Gu
Goyang-City, G, yunggi-Do
Contact: Mr Yoo
Tel: 82-3L-969-7286/7
Fax: 82-3T-969-7284
Email: asglobal@naver.com
**Dealer/Distributor**

**JAPAN**

### SHIMADA & CO LTD

No. 4-2, Ichioka 3-Chome
Minato-Ku, Osaka, 552-0012
Tel: 81-6-6574-0908
Fax: 81-6-6575-3545
Email: shimato@shimatonet.co.jp
www.shimatonet.co.jp
**Dealer/Distributor**

**MALAYSIA**

### RAINBOW RUNNER SDN BHD

5, Ukay Boulevard, Jln Lingkaran Tengah Dua
Hulu Kelang, 68000 Ampang, Selangor
Tel: +603 4162 2837, +603 4162 3837
Fax: +603 4161 7837
Website: www.rainbowrunner.net
**Dealer/Distributor**

**MALDIVES**

### COLTRI COMPRESSORS MALDIVES

Malè, Republic Of Maldives
Contact: G.Athafaiy, Mr Luigi Scardigno
Mobile: +9607924199
Email: info@coltrisubmaldives.com
Email: service@coltrisubmaldives.com
**Dealer/Distributor**

**NEW ZEALAND**

### AIR TECHNOLOGY LTD

5/20 Constellation Drive
Mairangi Bay 0632 Auckland
PO Box 305065 Triton Plaza
North Shore, Auckland 0757, New Zealand
Contact: Ross Irvine
Tel: 64-9-478 9995
Fax: 64-9-478 6221
Website: www.divecompressors.co.nz
**Dealer/Distributor**

**SINGAPORE**

### ALLROUND ADVANCED TECHNOLOGIES PTE LTD

105 Sims Ave #03-06 Chancerlodge Complex
Singapore 387429
Tel: +65 749 2778
Fax: +65 749 2977
Email: enquiry@allround.com.sg
**Dealer/Distributor**

**TAIWAN**

### NELVEN CO LTD

16F-8, No. 400, Huan Bei Road
Zhongli city, Taoyuan county 320, Taiwan
Tel: (03) 4260860
Fax: (03) 4228179
Email: nelven@ms18.hinet.net
Website: www.nelven.com.tw
**Dealer/Distributor**

**THAILAND**

### SIAM DIVING ENTERPRISES ASIA PACIFIC CO LTD

No.12, Chaloemprakiat Ratchakan Thi 9 Road
Soi 48, Dokmai, Prawet, Bangkok, 10250, Thailand
Tel: +66 2 726-6101-5
Fax: +66 2 726-6106
Email: c.benelli@aerotecnicacoltriasiapacific.com
Email: sdesystems@csloxinfo.com
www.aerotecnicacoltriasiapacific.com
**Dealer/Distributor**

**VIETNAM**

### COLTRI COMPRESSOR VIETNAM

Address Lo 51 – 02, Hon Ro - Phuoc Dong
Nha Trang, Vietnam
Contact: Craig Anderson
Tel: +84 0914 (0) 29 790
Email: craig@coltrisubvietnam.com
Website: www.coltrisubvietnam.com
**Dealer/Distributor**

**PHILIPPINES**

### DIVE SUPPLY SUBIC INC

Office 4 & 7 EMS Building, 14th St., Subic Gate
Perimeter Road, Subic Freeport Zone
2222 Olongapo
**Dealer/Distributor**

**POINT OF SALE LOCATIONS**

### AQUAVENTURE WHITETIP DIVE SUPPLY – BORACAY

Stall 109 D' Mall D' Boracay Phase 4 Station 2
Brgy. Balabag, Malay Aklan, Boracay
Tel: (6336) 288-5615
Email: boracay@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – CEBU

Unit 14 Borromeo Arcade Bldg.
39 F Ramos Street, Cebu
Tel: (6332) 412-5561
Email: cebu@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – MACTAN

Bagumbayan 2, Maribago, Mactan Island, Lapu Lapu
Tel: (6332) 492-0122
Email: mactan@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – MAKATI

Unit 101-102 Metropolitan Terraces Condominium
Sacred Heart cor. Kamagong Streets
San Antonio Village, Makati
Tel: (+632); 519-8375; 519-8376; 846-8344
Email: makati@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – ERMITA

ERMITA1362 A. Mabini Street
Unit 101-106 Joncor II Bldg.
Ermita, Manila
Tel: (632) 708 9990
Email: ermita@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

### AQUAVENTURE WHITETIP DIVE SUPPLY – PUERTO GALERA

Sabang Beach, Oriental Mindoro
Puerto Galera
Tel: (6343) 287-3172
Email: puertogalera@aquaventurewhitetip.com
Website: www.aquaventurewhitetip.com
**Dealer/Distributor**

## Cutters Edge

**FIRE RESCUE SAWS**

**AUSTRALIA**

### BIG RED TRUCK FIRE AND RESCUE SUPPLIES

12/65 Business Street, Yatala, QLD 4207
Tel: +61 (0) 7 3287 5504
Fax: +61 (0) 7 3287 5505
Email: asktheteam@bigredtruck.com.au
Website: www.bigredtruck.com.au

**CHINA**

### ANCOM SYSTEMS INC

Building 5, Courtyard 10 Village
Middle Road, North 3rd Ring Road
Beijing, PR 100011
Contact: Pei Zhang
Tel: 86 10 6202 2792
Fax: 86 10 6207 7929
Email: hung.fang@utoronto.ca
Website: www.ancom.cn
**Dealer/Distributor**

### NORLAN ENTERPRISES, INC

Room 952, #218 Tang Li Road
Chao Yang District, Beijing, PR 100012
Tel: 86 10 84673721
Fax: 86 10 84673770
Email: helenwang@norlan.cn
Website: www.norlan.cn
**Dealer/Distributor**

### WUXI RSP SAFETECH LTD

Block 3, Long Shan Wen Bo Industrial Park
Qian Yao Road, Wuxi, Jiangsu Prov.
Prc 214151
Tel: 86 510 8225 5991
Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com
**Dealer/Distributor**

**HONG KONG**

### TIAN YOU INTERNATIONAL DEV CO

Room 119, International Trade Centre
11-19 Sha Tsuo Road, Tsuen Wan, Hong Kong
Contact: Philip Shek
Tel: 852 24161241
Fax: 852 24169636
Email: info@tianyou.com.hk
**Dealer/Distributor**

**INDIA**

### ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar,
Sushil Muni Square, Shankar Road
New Delhi PIN – 110 060, India
Tel: 91 11 49458800
Fax: 91 11 49458844
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**INDONESIA**

### PT MITRA TEKNIKATAMA SUPPLINDO

Jl Ekor Kuning No 1
Pasar Ikan
Penjari
Jakarta Utara 14440
Indonesia
Contact: Adelaide Sagitaria
Tel: 62 216 602 2144
Fax: 62 216 602 2146
Email: adelaide@mitrateknikatama.com
**Dealer/Distributor**

**JAPAN**

### TEIKOKU SEN-I CO LTD

5-13, 2 Chome
Nihonbashi
Chuo-Ku
Tokyo 103
Contact: Mr Satoh
Tel: 81 332813026
Fax: 81 332813090
Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
**Dealer/Distributor**

**MALAYASIA**

### CITO MARKETING, SDN BHD

No 11
Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
Selangor
Darul Ehsan 47500
Contact: Abu Raihan Jaafar
Tel: 60 37311286
Fax: 60 37340583
Email: cito@po.jaring.my
**Dealer/Distributor**

### SJA TRADE & SERVICES, SDN BHD

Kelana Center
Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor
Darul Ehsan 47301
Contact: Hetty Zurin Hamdan
Tel: 60 37847400
Fax: 60 37848500
**Dealer/Distributor**

**PHILLIPINES**

### SMARTGUARD PHILIPPINES, INC

#16 Blk 4, 7th Street
Bacolod City
Negros Occidental 6100
Telefax: +63 34 7091549
Mobile: +63 918 8881729
Email: rescue@smartguardphilippines.com
**Dealer/Distributor**

**SOUTH KOREA**

### JINUTEC INTERNATIONAL DIVISION

711 Visiontop Officetel 374-4
Won Dong, Osan City
Korea
Contact: Na Hae-Yul
Tel: 82 31 3758558
Fax: 82 31 3754884
Email: hyna@jinutec.com
Website: www.jinutec.com
**Dealer/Distributor**

**TAIWAN**

### ALL STRONG TRADING CO LTD

No 110 Sec. 2
Chang An E Road
7th Fl. King Isian Bldg
PO Box 46-482
Taipei
Contact: K C Huang
Tel: 886 2250 79976
Fax: 886 2250 75253
Email: allstron@ms19.hinet.net
**Dealer/Distributor**

### PACIFIC CENTURY INDUSTRIAL CO LTD

PO Box 55-719
6F-7 No, 21, Sec 3
Min-chung East Rd
Taipei
Contact: Ming Ko
Tel: 886 2251 77217
Fax: 886 2282 78101
Email: mingko@ms16.hinet.net
**Dealer/Distributor**

## Dräger

**AUSTRALIA**

### DRÄGER SAFETY PACIFIC PTY LTD

8 Acacia Place
Notting Hill VIC 3168
Tel: +61 3 9265 5000
Fax: +61 3 9265 5095
Email: customer.service@draeger.com
Website: www.draeger.com
**Representative Office**

**CHINA**

### DRÄGER SAFETY EQUIPMENT (CHINA) CO LTD

A22, Yun An Road, B Area
Tianzhu Airport Industrial Zone
Beijing 101300
Tel: +86 10 8049 8000 Ext. 213
Fax: +86 10 8049 8005
Email: sales.safety.cn@draeger.com
Website: www.draeger.com
**Representative Office**

**INDONESIA**

### PT DRÄGERINDO JAYA

Beverly Antasari Building
Jl. Pangeran Antasari No.67
Unit L, Cilandak Barat
Jakarta Selatan 12430
Tel: +62 21 7513 289
Fax: +62 21 7512 052
Email: Product.supportindonesia@draeger.com
Website: www.draeger.com
**Representative Office**

**JAPAN**

### DRÄGER SAFETY JAPAN LTD

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Koto-Ku
Tokyo 135-0016
Tel: +81 3 4461 5111
Fax: +81 3 4461 5100
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Website: www.draeger.com
**Representative Office**

**KOREA (SOUTH)**

### DRÄGER SAFETY ASIA (KOREA REP. OFFICE)

#S-21, 8th floor, Garden 5 Tool-dong
292 Munjeong-dong, Songpa-gu
Seoul, 138-962
Tel: +82 2 64 15 8222
Fax: +82 2 64 15 8223
Email: Sales.korea@draeger.com
Website: www.draeger.com
**Representative Office**

**MALAYSIA**

### DRÄGER SAFETY ASIA PTE LTD (MALAYSIA)

No. 2 & 4, Jalan Industri USJ 1/1
Taman Perindustrian USJ 1
47600 Subang Jaya
Selangor D.E., Malaysia
Tel: +603-8022-1800
Fax: +603-8022-1900
Email: enquiry.safetymy@draeger.com
Website: www.draeger.com
**Representative Office**

**SINGAPORE**

### DRÄGER SAFETY ASIA PTE LTD

67 Ayer Rajah Crescent
#06-03, 139950 Singapore
Tel: +65 6872 9288
Fax: +65 6512 1908
Email: dsa.singapore@draeger.com
Website: www.draeger.com
**Representative Office**

**TAIWAN**

### DRÄGER SAFETY TAIWAN CO LTD

12F, Kuohua Building, 868-5
Chung Cheng Road
Chung Ho City 23586
Tel: +886 2 2223 6388
Fax: +886 2 2223 2258
Email: sales.taiwan@draeger.com
Website: www.draeger.com
**Representative Office**

**THAILAND**

### DRÄGER SAFETY (THAILAND) LTD

123/20, Nonsi Road
Kwaeng Chongnonsi
Khet Yannawa
Bangkok 10120
Tel: +66 2 681 1781
Fax: +66 2 681 1780
Email: sales.thailand@draeger.com
Website: www.draeger.com
**Representative Office**

**VIETNAM**

### DRÄGER SAFETY ASIA PTE LTD

Room 868, 8th Floor, HITC Tower
239 Xuan Thuy
Cau Giay District
Hanoi, Vietnam
Tel: +84 4 37955626
Fax: +84 4 37955627
Email: sales.safety.vn@draeger.com
Website: www.draeger.com
**Representative Office**

## DR STHAMER HAMBURG

**SINGAPORE**

### TETRA FIRE ENGINEERING PTE LTD

10 Ubi Crescent #05-04, Ubi Techpark
Singapore 408564
Contact: Mr T S Lee
Tel: (65) 6841 4429
Fax: (65) 6841 5267
Email: tetra@singnet.com.sg
**Dealer/Distributor**

**INDIA**

### M/S ASKA EQUIPMENTS LTD

R-482, New Rajendra Nagar
Ganga Ram Hospital Square, Shankar Road
New Delhi – 110 060 India
Contact: Mr Harsh A Garg – Director
(All India Sales)
Tel: 011 494458800
Mobile: +91 11949458844
Fax: 011 27014413
Email: info@askagroup.com
Website: www.askagroup.com
**Dealer/Distributor**

**TAIWAN**

### PAO TAI LNTERNATIONAL ENTERPRISE LTD

No.39, Lane 177, Dahua Rd
Jhongli City, Taoyuan County 320
Taiwan (R.O.C.)
Contact: Mr Sunter Sun
Mobile: 0933-114-090
Fax: 886-3-4632376
**Dealer/Distributor**

## Fike

**AUSTRALIA**

### FIRE PROTECTION TECHNOLOGIES PTY LTD

Unit 1/251, Ferntree Gully Road
PO Box 75, Mt Waverley
Victoria 3149, Australia
Tel: +61 3 8542 8901
Fax: +61 3 9543 9109
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au
**Dealer/Distributor**

**BANGLADESH**

### MARS SYNDICATE

114A, New DOHS, Eastern Rd. Lane #6
Mohakhali Dhaka # 1206
Bangladesh
Contact: Ms Purabi Matin CEO/
Mr Akm Rasid Hassan Technical
Tel: +88 02-882 6893/+88 018-1922 6281
Email: marssyndicate@gmail.com
**Dealer/Distributor**

**CHINA**

**I-SAFE FIRE EQUIPMENT (TIANJIN) LTD**
No.16, Chong Qing Street
Jin Nan District
Tian Jin
P.R. China
Tel: +86 22 8882 6965
Fax: +86 22 8882 6970
Email: sales@isafe-fire.com
**Dealer/Distributor**

**HONG KONG**

**THE JARDINE ENGINEERING CORPORATION LTD**
5/F Tower A
Manulife Financial
223-231 Wai Yip Street
Kwun Tong
Kowloon
Hong Kong
Tel: 852 2807 4684
Fax: 852 2503 4210
Email: tommy.tam@jec.com
Website: www.jec.com
**Dealer/Distributor**

**INDIA**

**NEWAGE FIRE PROTECTION ENGINEERS**
7, Champaklal Udyong Bhavan
Sion (E) Mumbai 400 022
India
Tel: +91 22 2407 7421
Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com
**Dealer/Distributor**

**INDONESIA**

**PT. KALIMUTU MITRA PERKASA**
Sentra Latumenten AA#18
Jl. Raya Latumenten Kav. 50
Jakarta 11460
Tel: +62 21 5696 0197
Fax: +62 21 5696 0497
Email: suastika@kalimutu.com
**Dealer/Distributor**

**PT. KENCANA LINTAS MENTARI**
Jl. Pangeran Jayakarta, 85AK
Jakarta 10730
Indonesia
Tel: +62 21 628 1933
Fax: +62 21 628 1976
Email: priyana@cbn.net.id
**Dealer/Distributor**

**KOREA**

**GM ENGINEERING & SUPERVISION CO LTD**
Unit D-1209
Gwangmyeong Techno Park
#60 Haan-ro
Gwangmyeong-si
Gyeonggi-do
Korea
Tel: (82) 02-844-8588
Fax: (82) 02-846-9767
Mobile: (82) 010-5036-3123
Email: ts.jeong@gmens.co.kr
**Dealer/Distributor**

**MALAYSIA**

**FIKE ASIA PACIFIC SDN BHD**
18B, 2nd Floor
Jalan Astak L U8/L
Bukit Jelutong
40150 Shah Alam
Selangor
Malaysia
Tel: +60 3 7859 1462
Fax: +60 3 7859 1461
Email: chun-wah.leong@fike.com
Website: www.fike.com
**Representative Office**

**SUKIADA ENGINEERING SDN BHD**
No. 20 Jalan Astaka L U8/L
Bukit Jelutong
40150 Shah Alam
Selangor
Malaysia
Tel: +60 3 7845 2008
Fax: +60 3 7845 6008
Email: bkwong@sukiada.com.my
Website: www.sukiada.com.my
**Dealer/Distributor**

**NEW ZEALAND**

**FIRE PROTECTION TECHNOLOGIES LTD**
Unit B1, 8 Henry Rose Place
Albany 0632
North Shore
Auckland
New Zealand
Tel: +64 (09) 415 5488
Fax: +64 (09) 443 7867
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

**PAKISTAN**

**MGH ENGINEERING AND CONTROL PVT LTD**
H. # 20 St.
#5/A Kot Shahabdin
Shahdrah
Lahore 54950
Pakistan
Tel: +92 42 7913064
Fax: +92 42 7913064
Email: mansoorshaker@yahoo.com
Website: www.mgheng.com
**Dealer/Distributor**

**PHILIPPINES**

**FIRE SOLUTIONS INC**
1028 Malaya Street
Malanday Marikina City
1805 Philippines
Tel: +63 2 371 9774
Fax: +63 2 374 3041
Email: firesolutions@skyinet.net
**Dealer/Distributor**

**SINGAPORE**

**AZCEND ASIA PTE LTD**
Blk 21
Kallang Avenue #04-165
Singapore 339412
Tel: (65) 6299 0798
Fax: (65) 6299 3735
Email: Chiaw.fs@azcendasia.sg
**Dealer/Distributor**

**SRI LANKA**

**BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD**
122, Dawson Street
Colombo 02
Sri Lanka
Tel: +94 11 4717 500
Fax: +94 11 245 4653
Email: bldserv@sltnet.lk
**Dealer/Distributor**

**TAIWAN**

**SUNMORN INC**
7F.-2
76, Nan Jing W. Road
Taipei 10352
Taiwan
Tel: +886 2 2550 3500
Fax: +886 2 2550 5350
Email: merylyu@sunmoreinc.com
Website: www.sunmoreinc.com
**Dealer/Distributor**

**THAILAND**

**ANTI-FIRE CO LTD**
316-316/1
Sukhumvit 22 Road
Klongtoey
Bangkok 10110
Thailand
Tel: +66 2 260 4565
Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com
**Dealer/Distributor**

**VIETNAM**

**EUROPEAN TECH JSC**
No. 50, 218/27
Lac Long Quan Street
Tay Ho Dist.
Hanoi
Vietnam
Tel: +84 4 3755 7179
Fax: +84 4 3755 7178
Email: mscee@vnn.vn
**Dealer/Distributor**

## FIRE FIGHTING ENTERPRISES

**AUSTRALIA**

**AMPAC TECHNOLOGY PTY LTD**
7 Ledgar Road, Balcatta, Western Australia 6021
Tel: +618 9242 3333
Fax: +618 9242 3334
Website: www.ampac.net
**Dealer/Distributor**

**KOREA**

**HI MAX CO LTD**
Sicox Tower, 115-Ho 513-14, Sangdaewon-Dong
Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
Tel: +82 742 1190
Fax: +82 742 7698
Email: himax@himax119.co.kr
Website: www.himax119.co.kr
**Dealer/Distributor**

**NEW ZEALAND**

**AMPAC INDUSTRIES LTD**
PO Box 100-149, North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072
Fax: +64 94438073
**Dealer/Distributor**

**SINGAPORE**

**ACCLAIM SYSTEMS PTE LTD**
Blk 104, Boon Keng Road, 05-01
Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
**Dealer/Distributor**

**ALARM SUPPLY PTE LTD**
63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
**Dealer/Distributor**

**TAIWAN**

**HORING LIH IND CO LTD**
4f No 18 Lane 327 Chung Shan Road
Sec 2, Chung-Ho-City
Taipei Hsien, Taiwan
Tel: +886 2224 87599
Fax: +886 2224 07752
**Dealer/Distributor**

**THAILAND**

**TEEYA MASTER SYSTS CO LTD**
100/101-102 Vongvanji, Building B, 30th Flr
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: +662 2 6451130
Fax: +662 2 2488540
**Dealer/Distributor**

## HD FIRE PROTECT PVT LTD

**AUSTRALIA**

**HD FIRE PROTECT PTY LTD**
58/37, Slobodian Avenue, Eight Mile Plains
QLD – 4113, Australia
Tel: +61 433 194 344
Email: pacific@hdfire.com
**Representative Office**

**INDIA**

**HD FIRE PROTECT PVT LTD**
C-36, Nandanvan Industrial Estate
Lal Bahadur Shastri Marg
Opposite ACC Research Centre
Thane, Mumbai, Maharashtra 400604, India
Tel: +91 22 2582 6958
Email: info@hdfire.com
Website: www.hdfire.com
**Representative Office**

**INDONESIA**

**PT. TRIMITA WUJUD REKANUSA**
Jl. Gunung Sahari Raya 51/8
Jakarta Pusat 10610, Indonesia
Tel: +62 21 4227632
Email: exports@hdfire.com
**Dealer/Distributor**

## HOLMATRO

**AUSTRALIA**
### CHUBB FIRE & SECURITY
149-155 Milton St Ashfield
NSW 2131 Australia
Tel: +61 392 649 796
Email: Joan.Lambert@chubb.com.au
Website: www.chubb.com.au
**Dealer/Distributor**

**BANGLADESH**
### SPERRY INTERNATIONAL
5/5 Block-A
1st Floor
Iqbal Road
Mohammedpur Dhaka-1207
Bangladesh
Tel: +88 029 110 264
Email: SMNazrul@sam-sperry.com
Website: www.sam-sperry.com
**Dealer/Distributor**

**BHUTAN**
### TCD TRADER
PO Box 792 Changjalu
Thimphu Bhutan
Tel: +975 178 328 53
Email: TDorji212@gmail.com
Website: www.tcdtrader.com
**Dealer/Distributor**

**BRUNEI**
### IECS
8A Simpang 558
Jalan Pasir Kampong Berakas BB1314 Brunei
Darussalam
Tel: +673 877 79 68
Email: IECS.Brunei@gmail.com
**Dealer/Distributor**

**CAMBODIA**
### FIRESAFE CAMBODIA
165 Sotheros blvd
Phnom Penh Cambodia
Tel: +855 12 380 211
Email: Paul@firesafecambodia.com
Website: www.firesafecambodia.com
**Dealer/Distributor**

**CHINA**
### HOLMATRO CHINA
No 1801, Pangjin Road
Wujiang ETDC 215200 Suzhou, China
Tel: +86 512 6380 7060
Email: china@holmatro.com
Website: www.holmatro-china.com
**Regional Office**

**FIJI**
### PIONEER SUPPLIES
161 Toorak Road Suva Fiji Islands
Tel: +679 331 27 37
Email: Mahesh@pio-sup.com
Website: www.pio-sup.com
**Dealer/Distributor**

**HONG KONG**
### ABLESLINK COMPANY
Unit B4, 2/f., Block B, Sheung Shui Pl.
3 Ka Fu Close Sheung Shui
New Territories Hong Kong
Tel: +852 2466 4568
Email: Ableslink@yahoo.com
**Dealer/Distributor**

**INDIA**
### RESQ TECHNOLOGIES
C-202, Shilalekh Opp.
Police Stadium Shahibag
Ahmedabad - 380 004 India
Tel: +91 942 731 01 59
Email: RESQ.Technologies@gmail.com
Website: www.resqtechnologies.com
**Dealer/Distributor**

**INDONESIA**
### ESA KARYA MANDIRI
Jl. Danau Sunter Utara Kav. 60
Rukan Sunter Terrace Blok
C22 Jakarta 14350 Indonesia
Tel: +62 212 946 15 39
Email: EsaKarya@cbn.net.id
**Dealer/Distributor**

**JAPAN**
### AKAO
Shin-machi 4-13-1 Nishi-ku Osaka-fu
550-0013 Japan
Tel: +81 66 532 4131
Email: eigyo@akao-co.co.jp
Website: www.akao-co.co.jp
**Dealer/Distributor**

**KOREA**
### KYUNG JIN INTERNATIONAL
Kyung Jin B/D. 118-58 Yongdoo-dong
Dongdaemun-gu, Seoul Korea
Tel: +82 22 38 21 86
Email: info@kyungjinltd.com
Website: www.kyungjinltd.com
**Dealer/Distributor**

**MACAU**
### TCT TRI-CONTINENTAL TRADING
4/F-E, Dynasty Plaza Bldg.
411-417 Ald. Dr. C.
D'Assumpção Macau Macau
Tel: +853 7500 08
Email: TCT@macau.ctm.net
**Dealer/Distributor**

**MALAYSIA**
### PANDAN NIAGA
No81A, Jalan tabla 33/21
Shah Alam Techn. p
Seksyen 33 Shah Alam Selangor
Darul Ehsan 40400 Malaysia
Tel: +60 351 221 310
Email: PNSB@pn.com.my
Website: www.pn.com.my
**Dealer/Distributor**

**MONGOLIA**
### NANOPLANET
House #3, 6th Khoroo
10th Khoroolol
Bayangol District
Ulaanbaatar 16081 Mongolia
Tel: +976 88 09 66 48
Email: info@planet-mongolia.com
Website: www.nano.planet-mongolia.com
**Dealer/Distributor**

**NEW ZEALAND**
### CHUBB FIRE & SAFETY PRODUCTS
3 Fisher Crescent (Private Bag 92207)
Mt Wellington Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: www.chubb.co.nz
**Dealer/Distributor**

**PAKISTAN**
### HASEEN HABIB TRADING
7, Shaheen View, Block 6
PECHS Main Shahrae Faisal
Karachi Pakistan
Tel: +92 213 452 62 40
Email: FBarry@haseenhabib.com
Website: www.haseenhabib.com
**Dealer/Distributor**

**PHILIPPINES**
### WALLGREEN INDUSTRIAL VENTURES CORP
62 West Avenue
Quezon City 1104 Philippines
Tel: +63 241 108 18
Email: WIVCOR@yahoo.com
**Dealer/Distributor**

**SINGAPORE**
### ADVENTRA
48 Changi South St. 1 486130 Singapore
Singapore
Tel: +65 689 822 83
Email: PK.Tan@adventra.com.sg
Website: www.adventra.com.sg
**Dealer/Distributor**

**SRI LANKA**
### HALCHEM LANKA
No.07, Siri Dhamma Mawatha
Colombo 10 Sri Lanka
Tel: +94 112 677 941
Email: inquiries@halchem.net
Website: www.halchem.net
**Dealer/Distributor**

**TAIWAN**
### PARKSON TRADING
3F No. 50, Huaning Road, Guo-Shan Dis. 80471
Kaohshiung City Taiwan
Tel: +886 75 52 16 50
Email: PTCKPeng@parkson.com.tw
**Dealer/Distributor**

**THAILAND**
### CHASE ENTERPRISE (SIAM)
497 Prapinklao Road, Bangyeekhan, Bangplad
Bangkok 10700 Thailand
Tel: +66 281 940 00
Email: ChaseSiam@chasesiam.com
Website: www.chasesiam.com
**Dealer/Distributor**

**VIETNAM**
### WETEC TECHNOLOGY EQUIPMENT
10th Floor, 9 Lang Ha
Ba Dinh District Hanoi Vietnam
Tel: +84 945 582 626
Email: Khoa.TD@wetec.vn
Website: www.wetec.vn
**Dealer/Distributor**

## LHD GROUP (Lion Apparel)

**AUSTRALIA**
### LHD GROUP AUSTRALIA P/L
Unit 3, 15 Dunstan Road, Wingfield
South Australia, 5013
Australia
Tel: (+61) 8 8139 7777
Fax: (+61) 8 8139 7788
Email: lionasia@lionapparel.com
Website: www.lhd-group.com
**Representative Office**

**HONG KONG**
### LHD GROUP HONG KONG LTD
Unit 1003-1004
10/F, Block 3
Tins Center
3 Hung Cheung Road
Tuen Mun, N.T.
Hing Kong
Tel: (+852) 2463 2982
Fax: (+852) 2463 2770
Email: totalcarehk@lionapparel.com
Website: www.lhd-group.com
**Representative Office**

## NEWAGE INDUSTRIES

**INDIA**
### NEWAGE INDUSTRIES
Ambawadi Industrial Estate
Surendranagar
Gujarat, 363001 India
Tel: +91 2752 660500/01
Email: info@newage-india.in
Website: www.newage-india.in
**Representative Office**

PACIFIC
NEW ZEALAND

**AUSTRALIA**
### PAC FIRE AUSTRALIA
1/28 Burnside Road
Hallmarc Business Park
Yatala
QLD 4207
Australia
Tel: +61 7 3441 7100
Fax: +61 7 3441 7177
Email: sales@pacfire.com.au
Website: www.pacfire.com.au
**Dealer/Distributor**

**NEW ZEALAND AND ASIA-PACIFIC**
***(Excluding Australia)***

### PACIFIC HELMETS (NZ) LTD

PO Box 866, 315 Heads Road
Wanganui 4501, New Zealand
Tel: +64-6-344-5019
Fax: +64-6-344-5376
Email: sales@pacifichelmets.com
Website: www.pacifichelmets.com
**Manufacturer/Distributor**

## SCOTT SAFETY

**AUSTRALIA**

137 McCredie Road, Guildford
NSW 2161, Australia
Contact: Peter Richards
Mobile: 0419 020 374
Tel: +61 2 8718 2029
Email: prichards@tycoint.com
Website: www.scottsafety.com
**Representative Office**

**NEW ZEALAND**

6 Portage Road, New Lynn
Auckland, New Zealand
Tel: +64 (9) 826 1716
Fax: +64 (9) 827 2288
Email: scott.sales.anz@tycoint.com
Website: www.scottsafety.com
**Representative Office**

## TFT® TASK FORCE TIPS®
FIRE FIGHTING EQUIPMENT

**AUSTRALIA**

### GAAM EMERGENCY PRODUCTS

29 Temple Dr., PO Box 211
Thomastown, Victoria 3074, Australia
Tel: +61 3 9464 8400
Email: iprice@tycoint.com
Website: www.gaam.com.au
**Dealer/Distributor**

**BRUNEI**

### S.K. ROSENBAUER PTE LTD

8 Tuas Drive 2
Singapore, 638643, Singapore
Tel: (+65) 6862 3155
Email: tony.lim@skrosenbauer.com
Website: www.skrosenbauer.com
**Dealer/Distributor**

**CHINA**

### TOKIND INDUSTRIAL LIMITED

Room 608, 4#
Hongqiao International Building
Lane 797, Zunyi Road
Shanghai, 200051, China
Tel: +86 (21) 5187-5877
Email: hezhizhong@tokind.com.cn
Website: www.tokind.com.cn
**Dealer/Distributor**

**HONG KONG**

### ROTTER INTERNATIONAL LTD

Flat B 1/F Block 3, Kowloon
Hong Kong
Tel: (852) 2751 7770
Email: jacky@rotter.com.hk
Website: rotter.com.hk
**Dealer/Distributor**

**INDIA**

### FOREMOST TECHNICO PVT LTD

M-1, Green Park Extension
New Delhi 110016, India
Tel: +91 (11) 2619 6982
Email: foremosttechnico@gmail.com
Website: www.foremost-india.com
**Dealer/Distributor**

**INDONESIA**

### PT PALMAS ENTRACO

JL. K.H. Samanhudi No. 85
Jakarta Pusat, 10710
Tel: +62 (21) 384 1681
Email: sales@palmas.co.id
Website: www.palmas.co.id
**Dealer/Distributor**

**JAPAN**

### YONE CORPORATION

23, Nishinakaai-Cho, Nishinokyo
Nakagyo-Ku, Kyoto 604, Japan
Tel: +81 (7) 582-11185
Email: t.yone@myad.jp
Website: www.yone-co.co.jp
**Dealer/Distributor**

**KOREA (SOUTH)**

### SHILLA FIRE CO LTD

433-11 Non Hon-Dong
Nam Dong-Gu
Inchon City 405-300
South Korea
Tel: +82-02-3665 9011
Email: kofire77@hotmail.com
Website: www.firekorea.com
**Dealer/Distributor**

**MALAYSIA**

### SENTRIX TECHNOLOGY SDN BHD

No. 22, Jalan TP 3/1
Taman Perindustrian Sime UEP
47620 Subang Jaya
Selangor Darul Ehsan, Malaysia
Tel: +603 8023-5228
Email: chong@sentrix.com.my
Website: www.sentrix.com
**Dealer/Distributor**

**MYANMAR**

### TASK FORCE TIPS INC

3701 Innovation Way, Valparaiso
IN 46383-9327, United States of America
Tel: 1 219 548 4000
Email: john.donnelly@tft.com
Website: www.tft.com
**Head Office**

**NEW ZEALAND**

### WORMALD LIFE SAFETY & RESCUE

8 Henderson Place, Auckland 1061
New Zealand
Tel: +64 9 826 1716
Email: sgurnick@tycoint.com
Website: www.wormald.co.nz
**Dealer/Distributor**

**PAKISTAN**

### PAKISTAN VEHICLE ENGINEERING

D-134, S.I.T.E., Karachi
Pakistan – 75700
Tel: 0092-21-32571426
Email: info@pve.com.pk
Website: www.pve.com.pk
**Dealer/Distributor**

**PAPUA NEW GUINEA**

### TASK FORCE TIPS INC

3701 Innovation Way
Valparaiso, IN 46383-9327
United States of America
Tel: 1 219 548 4000
Email: john.donnelly@tft.com
Website: www.tft.com
**Representative Office**

**PHILIPPINES**

### ALLIANCE INDUSTRIAL SALES

Unit 4, Finlandia Town Homes
#1700 Dian, cor. Finlandia Street
Brgy, San Isidro, 1234 Makati City
Philippines
Tel: +63 2 7561 749
Email: alliance8@pldtdsl.net
**Dealer/Distributor**

**SINGAPORE**

### S.K. ROSENBAUER PTE LTD

8 Tuas Drive 2, Singapore 638643
Singapore
Tel: +65 6862 3155
Email: tony.lim@skrosenbauer.com
Website: www.skrosenbauer.com
**Dealer/Distributor**

**TAIWAN**

### LEADING SAFETY

26 Lane 392 Fude 1st Road, Taiwan, R.O.C.
Tel: +866 2 8693 2345
Email: james@leading.com.tw
**Dealer/Distributor**

**THAILAND**

### ANTI-FIRE CO LTD

316-316/1, Sukhumvit 22 Road
Klongtoey Klongtoey
Bangkok 10110, Thailand
Tel: +66 2 260-45659
Email: sithichai@antifire.com
Website: www.antifire.com
**Dealer/Distributor**

**VIETNAM**

### TAN DUC JOINT STOCK COMPANY

N15-16 D2 Street, Ho Chi Minh City, Vietnam
Tel: 84-88990 678
Email: techdyn@hcm.fpt.vn
Website: www.tanducco.com.vn
**Dealer/Distributor**

## tyco Fire Suppression & Building Products

**SINGAPORE**

### TYCO FIRE SUPPRESSION & BUILDING PRODUCTS

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.tycofsbp.com
**Representative Office**

### ANSUL

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.ansul.com
**Representative Office**

### HYGOOD

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.hygood.co.uk
**Representative Office**

### PYRO-CHEM

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.pyrochem.com
**Representative Office**

### SKUM

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.skum.com
**Representative Office**

### SABO FOAM

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
Tel: (+65) 6577 4360
Fax: (+65) 6481 8791
Email: sales-ap@tycofp.com
Website: www.sabofoam.com
**Representative Office**

## XTRALIS

### AUSTRALIA

#### XTRALIS PTY LTD

4 North Drive, Virginia Park
236 – 262 East Boundary Road
Bentleigh East, VIC 3165
Tel: +613 9936 7000
Fax: +613 9936 7202
Website: www.xtralis.com.
**Regional Head Office**

#### XTRALIS – NSW

Suite 106, 55 Blaxland Road, Ryde, NSW 2112
PO Box 336, Ryde NSW 1680
Tel: +612 9808 2577
Fax: +612 9808 2599
**Representative Office**

#### XTRALIS – QLD

1048 Beaudesert Road
Coopers Plains, QLD 4108
Tel: +617 3246 5253
Fax: +617 3216 6599
**Representative Office**

#### XTRALIS – SA

Module 2 West, Endeavour House
Fourth Avenue Technology Park
Mawson Lakes, SA 5095
Tel: +618 7002 5160
**Representative Office**

### CHINA

#### XTRALIS – SHANGHAI

Room 20E, Zhaofeng World Trade Building
No. 369 Jiangsu Road
Changning District, Shanghai 200050
Tel: +8621 5240 0077
Fax: +8621 5238 2443
**Regional Head Office**

#### XTRALIS – BEIJING

Room 1302, Air China Plaza, No. 36 Xiaoyun Road
Chaoyang District, Beijing 100027
Tel: +8610 82 250 691
Fax: +8610 82 250 716
**Representative Office**

#### XTRALIS – GUANGZHOU

Room 1205 Building B Wenxingge,
No. 408 Central Jiefang Road
Yuexiu District, Guangzhou 510030, China
Tel: 8620 8318 6855
Fax: 8620 8317 6775
**Representative Office**

#### XTRALIS – WUHAN

No. 12, Gate 37, St 115
Guanghuaxincun, Qingshan Dist
Wuhan 430080, China
Tel: 8627 8668 1621
Fax: 8627 8668 1621
**Representative Office**

#### XTRALIS – HONG KONG

Room 2301, World Wide House
19 Des Voeux Road, Central, Hong Kong
Tel: 852 2916 8876
Fax: 852 2916 8897
**Representative Office**

### INDIA

#### XTRALIS – MUMBAI

805, 8TH Floor, Crystal Paradise
near Shah Industrial Estate
Off Veera Desai Road, Andheri (West)
Mumbai 400058, India
Tel: 91 224 264 7770
Fax: 91 224 264 7775
**Representative Office**

#### XTRALIS – DELHI

B-16, Sector 19, Noida, U.P., Delhi, India 201 301
Tel: +91 120 426 3634
**Representative Office**

#### XTRALIS – BANGALORE

301, Suhaat Residency, S. G. Palya
C. V. Raman Nagar, Bangalore, India 560 093
Tel: 91 98866 43314
**Representative Office**

#### XTRALIS – CHENNAI

222, Sangam Apartments, Old no. 159, New no 233
Beracah Road, Kellys, Chennai, India 600010
Tel: 91 98412 81367
**Representative Office**

### KOREA

#### XTRALIS – SEOUL

#904, 9th Floor, Y Tower, 769 – 10
Jayang-dong, Gwangjin-gu, Seoul, Korea
Tel: 8210 9102 0914
Fax: 822 553 8832
**Representative Office**

### SINGAPORE

#### XTRALIS – SINGAPORE

7030 Ang Mo Kio Avenue 5
#08-30 Northstar@AMK, Singapore 569880
Tel: +65 6570 1864
Fax: +65 6570 1823
**Representative Office**

### SOUTH AFRICA

#### XTRALIS – JOHANNESBURG

PO Box 92561, Norwood
Johannesburg, South Africa 2117
Tel: 27 82 446 7602
**Representative Office**

### TAIWAN

#### XTRALIS – TAIPEI

3F, No. 181, Zhouzi Street, Neihu District
Taipei City, Taiwan
Tel: +886 2 2657 1962
Fax: +886 2 2657 2094
**Representative Office**

## YONE CORPORATION

### JAPAN

23 Nishi Nakaaicho, Nishinokyo
Nakagyo-ku, Kyoto 604 8441, Japan
Tel: +81 (0)75 821 1185
Fax: +81 (0)75 801 2263
Website: www.yone-co.co.jp
**Representative Office**

## ZIAMATIC

### AUSTRALIA

#### ANGUS FIRE

Ferntree Gully Business Post Centre
PO Box 291, Ferntree Gully
Victoria 3156, Australia
Tel: 613-9765-3800
Fax: 613-9765-3801
**Dealer/Distributor**

#### CHUBB FIRE

314 Boundary Road, Dingley
Victoria 3172, Australia
Tel: 612-8748-7235
Fax: 612-9475-1440
**Dealer/Distributor**

#### KIDDE AUSTRALIA PTY LTD

PO Box 682, Baeside
Victoria 3195, Australia
Tel: 613-9518-5588
Fax: 613-9518-5577
**Dealer/Distributor**

#### QUELL FIRE & SAFETY

17-19 Orion Road, Lane Cove
New South Wales 10000, Australia
Tel: 612-9928-7456
**Dealer/Distributor**

#### SEM FIRE & RESCUE PTY LTD

PO Box 124, Wendouree, Victoria 3355
Australia
Tel: 613-5339-3109
Fax: 613-5338-1329
**Dealer/Distributor**

### CHINA

#### GENTECH VEHICLE ENGINEERING

Shop B1-B23, G/F., 6 Choi Fai Street
Sheung Shui, N.T., Hong Kong, China
Tel: 852-2473-6201
Fax: 852-2493-2390
**Dealer/Distributor**

#### FIRE SERVICES DEPARTMENT

333 Canton Road Tsim Sha Tsui
Kowloon
Hong Kong, China
Tel: 852-2733-7829
Fax: 852-2311-2542
**Dealer/Distributor**

### INDIA

#### NEWAGE INDUSTRIES

Ambawadi Industrial Estate
Surendranagar
Gujarat, 363001, India
Tel: 91-022-2407-7421
Fax: 91-022-2407-4229
**Dealer/Distributor**

### INDONESIA

#### PT. BURMI CERAH AGUNG

Jalan Pangerah
Jayakarta No 68 Blok A/10
Jakarta 10730, Indonesia
Tel: 622-1639-2889
Fax: 622-1629-8887
**Dealer/Distributor**

#### CV RAHMA

Jalan Pangeran Antasari No 25
Karang Rejo RT. 62
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The Abbey Manor Business Centre, The Abbey,
Preston Road, Yeovil, Somerset BA20 2EN,
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